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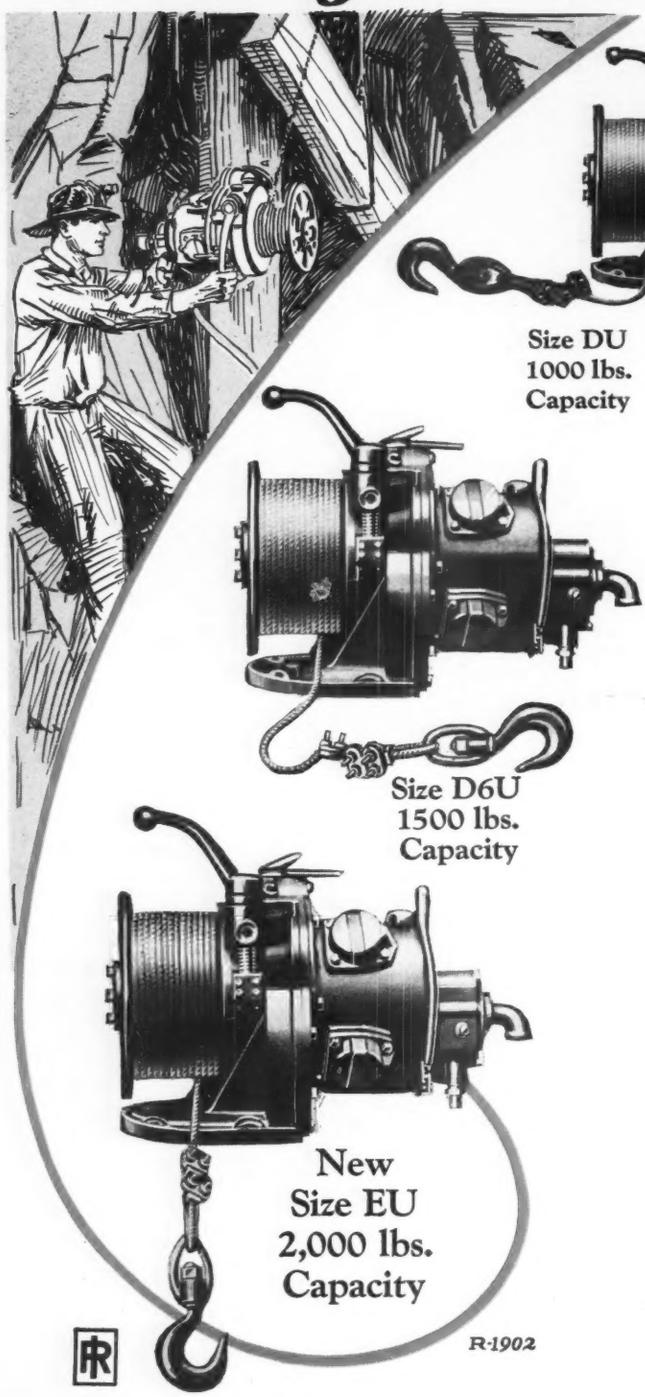

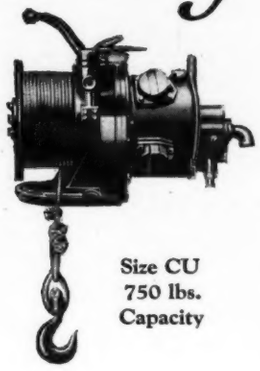

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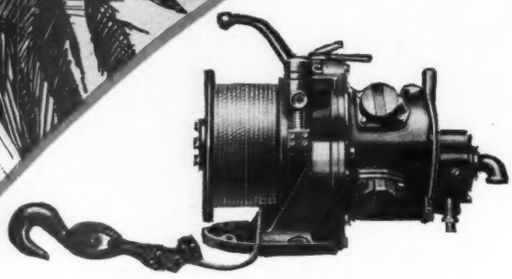

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Volume 127 *Number 22*

ENGINEERING AND MINING JOURNAL

A consolidation of "Engineering and Mining Journal" and "Mining and Scientific Press"

A. W. ALLEN, *Editor*

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New York, June 1, 1929

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McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

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CHICAGO, 520 North Michigan Avenue
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CLEVELAND, Guardian Building
ST. LOUIS, Bell Telephone Building
SAN FRANCISCO, 883 Mission St.
LONDON, 6 Bouverie St., London, E. C. 4

Cable Address: "Machinist, N. Y."

Publishers of
Engineering News-Record — American Machinist
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Electrical West
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

SUBSCRIPTION PRICES: United States, $6 a year. U. S. Possessions, Canada, Mexico and the countries of Central and South America, $7.50 a year. All other foreign countries, $10 a year. Single copy, 25 cents. Published weekly. Entered as second-class matter, June 20, 1879, at the Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A.

CHANGE OF ADDRESS
Subscribers are requested to send both the old and the new address when they move to a new address.

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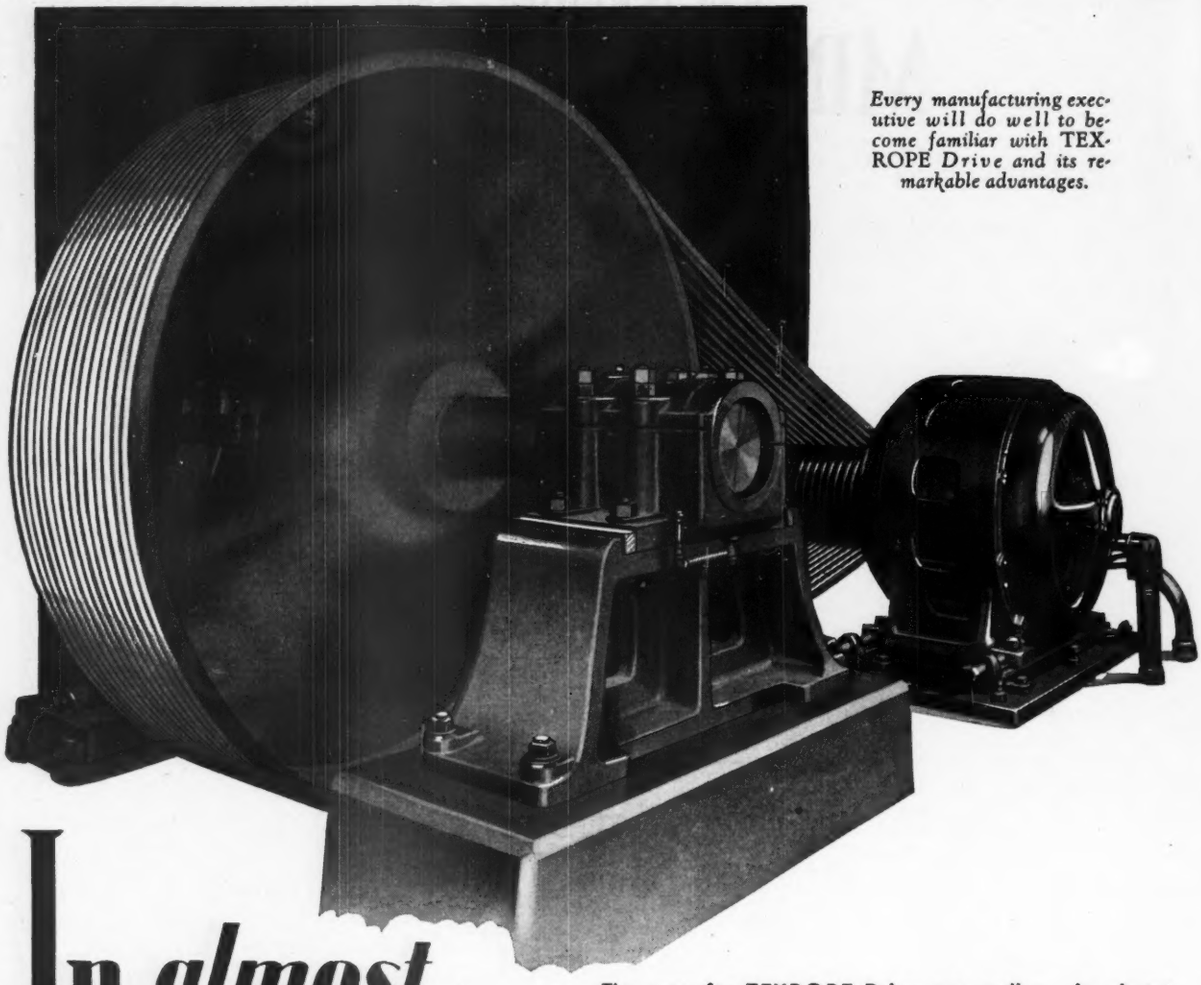
11,313 Copies Printed This Issue

Total Number of Issues to Date 3,284



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Volume 127 — *New York, June 1, 1929* — Number 22

Another Mining Investment Trust Makes Public Offerings

INVESTMENT TRUSTS, whereby the small investor has the opportunity to diversify his holdings without buying minimum share lots in a variety of companies, have had a fairly rapid growth in the United States since the idea was imported from England not many years ago. A general rise in the stock market since 1923 has favored their success, and their mortality has not been high. To be sure, with a policy of frequent buying and selling it is perfectly possible not to show net profits even when the market gradually advances over a long period of time; but, with a reasonable intelligence exhibited in the trading, success should not be difficult. On the other hand, in a long decline, the chances of profit are not so good, though clever traders can make money as well in a declining market as in an advancing one by taking advantage of day-to-day price fluctuations. Short selling need not be resorted to, a practice generally considered fundamentally undesirable. High rates for call money have made it possible for investment trusts, as well as others, to keep their cash resources working to advantage even when a long position on stocks was not considered desirable, and this opportunity has been made the most of recently.

Investment trusts may cover the whole industrial field, but many of them are limited to specific industries, affording the opportunity for the small investor to pick the industry he thinks affords most promise, and then to diversify his investment in that field. In mining, Newmont was the first to ask for and receive public support. Last year, Metals and Mining Shares was incorporated, with reported successful functioning since it was launched. It is not yet listed, as treasury stock is still being sold freely, but listing on one of the important exchanges seems only a matter of time. In the last few weeks another company of this type has made a bid for public support with the listing of its shares on the New York Curb. This organization, known as Mayflower Associates, Incorporated, succeeds to the business and assets of predecessors launched five years ago by a New York Stock Exchange house—Foster, McConnell & Company.

Mayflower Associates numbers among its directorate such well-known names in mining and mining finance as Archibald Douglas, Fred Hellman, William L. Honnold, Harvey S. Mudd, Philip Wiseman, and Henry Krumb. Robert E. McConnell, also a director, and member of the Stock Exchange house managing the investments of the corporation, is a mining engineer who was born in Colorado and educated at Columbia, since when he has had wide experience in both mining and finance. H. Elbert Foster, Jr., his associate and also a director of Mayflower, was formerly a member of the staff of the J. G. White organization. No better foundation for the success of an investment trust exists than a directorate and managerial board of good repute, mature experience in their field, and of more than ordinary financial acumen. In all of these respects, Mayflower Associates meets the requirements.

Several other private mining investment trusts are still fledglings. Officials of the important mining groups in New York are guiding many of them, and, following success in a small way, more will be heard from some of them later on. In the meantime, most of them are accepting but not soliciting financial support from those of their friends who feel that the prospects are sufficiently encouraging.

Organizations of this kind are constructive in mining development, as well as providing a method of making money in Wall Street. A part of the funds is usually directed toward junior properties of promise that require money for development. In this connection, it is interesting to note that Mayflower Associates now has a very substantial sum invested in Rhodesia, and that Newmont has also been active in buying African securities. Promising properties in other parts of the world, as well, are not being overlooked; thus another aid is available in financing the prospect where unusual chances exist for the development of an important orebody.

Calumet & Hecla Will Remain at the Old Stand

THE office of Calumet & Hecla Consolidated, largest of the Michigan copper producers, will remain in Boston. That was decided at the extraordinary meeting of the company on May 23, called to vote on a proposed amendment to the bylaws of the company that would permit removal of the office to 25 Broadway, New York City. By a margin of about forty-five thousand shares, out of more than one million four hundred thousand cast, the amendment was voted down, against the suggestion of Mr. Rodolphe L. Agassiz, the chairman of the board of directors, who made the proposal for removal.

Behind these prosaic facts there is, however, another story. A suit is now pending in the Massachusetts courts concerning the purchase, by Mr. Agassiz and Mr. James MacNaughton, president and general manager of the Calumet & Hecla company, of certain shares of Cliff Mining, a subsidiary of Calumet & Hecla. These shares were purchased after a report had been circulated that the Cliff mine was to be permanently abandoned. No denial of this report was made, either by Mr. Agassiz or

Mr. MacNaughton, who are president and vice-president of Cliff, respectively. At present the mine is being explored with diamond drills, following the unwatering of the workings.

Mr. Quincy A. Shaw, a director of Calumet & Hecla, pointed out the seeming impropriety of the purchase of Cliff shares at the annual meeting of Calumet & Hecla last year. As a result, the suit against Messrs. Agassiz and MacNaughton was started. When the proposal that the offices be moved from Boston to New York was made, Mr. Shaw led the fight to retain them at the old stand. He felt that such a step would impede the progress of the trial in a Massachusetts court.

The conduct of various interests in the mining industry has long been questioned by other industrial groups whose washing, it may be pointed out, has never been so thoroughly or so publicly aired as has that of the mining industry. *Engineering and Mining Journal* maintains that the public has a right to expect standards of conduct as high among mining companies as among any others, and feels that a quick adjudication of the present charges is eminently desirable. Calumet & Hecla is one of the best known of our large copper producers and has a long and honorable record. If the action of some of its officials is at variance with good taste and sound business principles, the facts should be made a matter of public record; if not, the sooner those officials are absolved, the better. It is to be hoped that the action in the Massachusetts courts can now be terminated without undue delay.

Group Insurance Increases With Industrial Activity

COINCIDENT with the recent announcement that general industrial activity in the first quarter of this year—and particularly the output of factories and mines—was larger in volume than ever before, a marked increase for the same period was reported in the amount of group insurance written. Some of this new protection for industrial workers must undoubtedly be attributed to the improved economic status of the country during the period, which has resulted in the expansion of many businesses and industries, and hence in an increase in group insurance carried by these organizations. The major portion of this new insurance, however, reflects a continuation of the phenomenal growth of group insurance in recent years—a growth from a total valuation of thirteen million dollars in 1912 to more than six thousand million dollars in 1927, and to ten thousand million dollars at the beginning of 1930, if the prediction made recently by a vice-president of one of the leading life insurance companies of the country be fulfilled.

Some years ago the general attitude of workers with respect to any welfare effort, such as group insurance, was one of marked indifference. It usually elicited the expression that, if more wages were paid, workers would provide adequately for their own futures and for those of their families. This attitude has changed materially, and both employers and employees are, generally, well aware of the benefits accruing from group insurance. To the worker it means, in many respects, an equivalent of wages saved and safely invested. To the employer, who by means of it can aid materially in the solution of workers' economic and social problems, group insurance is usually an important factor in accomplishing that closer employer-employee relationship which is now recognized as an outstanding feature of most successful enterprises. The amount of group insurance in force can be expected, therefore, to increase steadily with the economic development of the country. Its benefits far outweigh its cost. In brief, it is an investment paying substantial dividends on both a cash and good-will basis that the mining industry, among others, cannot afford to overlook.

Mining Industry Rapidly Becomes Internationalized

TWO DISTINGUISHED GUESTS at the recent annual banquet of the Institution of Mining & Metallurgy in London spoke from opposite personal viewpoints on one subject. The chairman of the Imperial Economic Committee, Sir Halford Mackinder, a member of His Majesty's Privy Council, looked backward and reminisced anent his participation during the war, as a statutory commissioner, in breaking the Merton combine—the *Metallgesellschaft*—claiming that the effort succeeded "in setting free certain metals within the British Empire which had previously been controlled from without. But today," he cautioned his hearers, "the same tendencies are reasserting themselves." The great organizations "need to be watched; they are capable of taking part in future struggles, which may not always be struggles involving bloodshed, but will none the less involve the livelihood of millions of peoples and the possibilities of survival of certain types of civilization."

Cryptic yet portentous comment! Reassuring is the opinion that bloodshed will not be continuous, despite the approaching hazards; but none could mistake the call to sectional emotionalism in the warning as to the "possibility of survival of certain types of civilization." As a remedy, one is told, the great organizations need to be watched. Surely, progressive action, stimulated by friendly technical rivalry, would be preferable. Those who would compete with honey as a table delicacy must do something more than watch the discipline, the organization, the purpose, and the zeal of a swarm of bees. To create an institution capable of a gigantic task; to apply skill, inventive ability, and hard work; to quicken the outcome by enthusiasm, courage, and optimism—in taking a great mineral resource out of idle hands, for example, to transform a mountain of discolored stone into the greatest copper mine in the world—such inevitable progression is deserving neither of rebuke nor apprehension. Rather, the achievement should serve as an object lesson to the watcher.

True it is that the spirit that led to the great war of 1914-18, fomented by suspicions and secret "diplomacy," is not dead but sleeping; but thankful one should be that a true and courageous international statesmanship is also in evidence. A speaker at the same banquet was Sir Auckland Geddes, chairman of the Rio Tinto Company, and formerly His Britannic Majesty's

ambassador at Washington. "Sir Halford," he said, "stirred a chord in me when he spoke of the *Metallgesellschaft* as a bugbear. It was so to me once, but now it is a partner. That," he continued, "is one little indication of a very widespread change that has been going on in connection with this industry through the years since the war. In other directions we have American, Belgian, French, and Spanish partners, and there are still others —Norwegian, Swedish, and so on—with whom we work in close association. Sir Halford spoke nationally, but the internationalization of this group of industries is proceeding apace . . ."

If Sir Auckland's picture were not the true one, no hope could be seen for the survival of civilization—of any civilization worthy of the name. If a hazard exists it must be looked for among those who are content to watch the progress of others, and then declaim against the outcome of initiative, courage, and faith in a future that refuses to envisage success as achievable only as the result of physical force and political scheming.

Custom Smelters, Purchasing Agents, and the Copper Market

BEHAVIOR of the copper market has always been closely connected with the selling policies of the custom smelters. During the strong seller's market that prevailed between late March, 1928, and early April, 1929, the normal attributes of the custom smelters were "lost in the shuffle," so to speak, because of the unusual intensity of demand prevailing. However, with the price of copper resting at 24 cents per pound early in April, the situation changed, almost overnight, from a seller's to a buyer's market, and the custom smelters became more dominant factors once again. Some such development as that actually recorded was inevitable sooner or later, though it may be argued that the abruptness of the decline was unfortunate, because of the shaking of confidence in the market situation that resulted, particularly among copper buyers and consuming interests generally. For this reason, producing and smelting interests as well as others vitally concerned with the welfare of the industry have been inclined to scrutinize the custom-smelter marketing practices with a critical eye, seeking information that might indicate a way for some improvement in this respect.

The problem of the custom smelter is a real one and not particularly difficult to understand: Copper in ore, concentrates, and other products is purchased on the basis of current published quotations, and the intake is relatively steady from week to week. Consequently, the seller of custom-smelter copper desires to sell the metal at a rate commensurate with his intake. During periods of advancing prices, the buying trend is toward delivery positions further and further forward. Such a trend is never welcomed by the custom smelter who balances sales against intake, for it means that under such conditions his sales participation is in smaller proportion than his production. Inasmuch as buyers are less inclined to purchase in a declining than in an advancing market, the precarious position of the custom smelter when a break in prices comes cannot go unappreciated. When prices are going up rapidly, the custom smelter is disinclined to sell in excess of his current intake. Then, with the arrival and passing of a peak in prices, he becomes not only a willing but an anxious seller if demand appears to be tapering off. The offerings of the custom smelters, under such circumstances, establish the market price, the primary producer seeing no reason why a slight relapse in demand should affect his position. As the custom smelter becomes increasingly anxious to sell, the buyers may become proportionally disinclined to buy, and the price descends until some semblance of equilibrium is approached. Thus, a too-rapid increase in prices is augmented by the market obligation of the custom smelter to limit his offerings to the amount of his intake, and the subsequent decline is accelerated by his obligation to sell a corresponding amount in an unwilling market. This condition is not new, and, unless marketing practices are to change drastically, it may never become obsolete.

A solution for this problem does exist, however. In several directions the opinion is held that it must be solved satisfactorily if the copper industry is ever to maintain reasonable stability in the price of its product. The logical solution appears to be a general adoption of the policy of selling copper on the same basis that it is bought—on "average" price contracts. One custom smelter already has done considerable reasoning on this subject, and has contracted for the sale of a substantial proportion of his regular intake on *Engineering and Mining Journal* average quotations. Assuming that each custom smelter could sell a sufficiently large proportion of his daily intake on a similar basis, much of the uncertainty and speculation might be removed from the copper marketing situation. The difficulty that such an attempt first encounters is the attitude of large-corporation purchasing agents whose existence depends on their success or assertions of success at beating "average" prices on their commitments. To overcome this obstacle is a task of no mean proportions, though this resistance must be broken down if stabilization is to become a tangible rather than a visionary result of producers' efforts in this direction.

The recent extreme fluctuation in copper prices is partly attributable to the buying tactics of the majority of purchasing agents. With "average" price contracts in common usage, it is unlikely that there would have been any such weird movements as were experienced in the first four months of 1929, when prices jumped from 16½ to 24 cents per pound and subsequently declined to 18 cents per pound by mid-April. Certainly no more than half of the total copper can be purchased at less than the average price over any considerable period of time; so for each unit of copper—in weight or value—secured below the average price, a corresponding quantity must sell above the average price. The point, then, appears to be: Find the purchasing agent who pays more than the average price. An investigation of this subject would reveal that virtually every purchasing agent claims, or has aspirations of claiming, to be able to beat the average price, or what may be termed the "par" of the copper golf course. Perhaps the executives of copper-consuming companies should scrutinize more closely the claims of their purchasing agents, or investigate the details of purchases for which no price-beating claims may be made. Such a scrutiny might bring to light data that would induce the copper consumer to look with favor on the practice of buying on an "average" price-contract basis.

ARIZONA HONORS

L. D. RICKETTS

FORTY YEARS is a good stretch of time in the life of a man or in the history of a new and growing territory. For a period nearly that long the careers of L. D. Ricketts and of the State of Arizona have been inextricably bound together. During those years the man has won recognition as one of the foremost engineers of a world that is beginning to appreciate the worth of the engineer, and the then territory has gained an ever increasingly important place in the social, economic, and political structure of the United States. Its wealth and position are based largely on its production of copper, in which it outranks any other territory of similar size in the world, and that production has been in no little measure increased by the technical and managerial abilities of Dr. Ricketts.

That both Dr. Ricketts and Arizona are cognizant of the ties that bind the one to the other is to be expected, but the fact was again emphasized on April 24, when a testimonial of appreciation for his years of achievement in the mining industry of Arizona was presented to Dr. Ricketts at a "State Dinner of Industries" held in Phoenix. Representatives of all industries and organizations in the state, including nearly every mining company of importance, to the number of 450, attended the dinner. The testimonial was an appreciative biography of Dr. Ricketts, by H. E. O. Whitman, bound in a handsome leather portfolio, with personal letters of appreciation from President Hoover, Governor John C. Phillips of Arizona, national mining and engineering institutions, and nearly 60 Arizona organizations. Robert E. Tally, of United Verde Copper, and president of the American Mining Congress; F. W. Bradley, of Alaska Juneau and Bunker Hill & Sullivan, and president of the A.I.M.E., and Governor Phillips were among the speakers.

A career that has been so crowded with achievement as that of Dr. Ricketts is not easily to be summarized in a few words, but from the biography prepared by Mr. Whitman these few facts have been taken to indicate the scope of his interest in the mining industry:

Louis Davidson Ricketts was born at Elkton, Md., on Dec. 19, 1859, in a vicinage where his ancestors had been farmers for generations and where his father owned and edited a country paper. When he was but a few months old his father died and his mother was left to rear four children alone. The family moved to Princeton, where Louis was educated at the university, after a preliminary academic career that was made difficult by a defect of his eyes. On graduation from Princeton, in 1881, he was chosen for a fellowship in chemistry, and later for a fellowship in economic geology. After these two years of post-graduate study, he was granted the degree of Doctor of Science. With this degree as his most important material asset, he set about the business of following Horace Greeley's celebrated advice to young men as to the proper direction in which they should travel. For four years he worked in Leadville and in Silverton, Colo., as a mine surveyor. In 1887, on the recommendation of the Governor of Colorado, he was appointed geologist of the then Territory of Wyoming. He went to Arizona for the first time in 1890 as examining engineer for Dr. James Douglas, of the Copper Queen.

Dr. Ricketts advised the purchase of the Fortuna and Pilares mines, at Nacozari, in northern Sonora, Mexico, and thereby took his first step as a developer of great mines. Dr. Douglas appointed him general manager in 1898, and he built at Nacozari a 400-ton concentrator and a smelter, first of the line of great plants that were to be designed or supervised by him. For the Douglas interests he also built the concentrator of the Detroit Copper Company at Morenci. These plants were the first

The Inspiration leaching plant, one of the many plants scattered throughout the Southwest, in the building of which Dr. Ricketts played an active rôle

ones in the West to use belt conveyors.

In 1901, Dr. Ricketts was succeeded at Nacozari by James S. Douglas, and took a well-merited vacation in Europe. But he had not severed his connections with Dr. Douglas or Phelps Dodge, for, when he returned, he was appointed general manager of Old Dominion, an affiliated company at Globe. At the same time he was consulting engineer for Cananea Consolidated Copper, operating what are now the holdings of Greene Cananea Copper in northern Sonora. He also built a large coal-washing plant for the Dawson Fuel Company, at Dawson, N. M.

In 1907, Dr. Ricketts left the Phelps Dodge organization, after a connection of more than seventeen years' duration, to become general manager for Cananea Consolidated. There he reconstructed the smelter and reorganized the entire operation. But the demand for his services as consulting engineer was still great, so that he had to find time to build the Arizona Copper Company smelter at Clifton and to supervise construction of the Calumet & Arizona smelter at Douglas. In this latter work he was associated with A. G. McGregor and J. C. Greenway for the first time, associations that were to continue and to bring important results to the copper-mining industry of Arizona. With McGregor, Dr. Ricketts designed the International Smelting plant at Miami, built to treat concentrate from the low-grade Miami and Inspiration mines.

LOUIS DAVIDSON RICKETTS

In the making of Inspiration, also, Dr. Ricketts took an important part. He was consulting engineer for the company, and it was largely his faith and that of C. E. Mills, in its possibilities, that led to the equipment of the Inspiration deposit. The success of the enterprise and the justification of his faith in it led to his being elected president of the company. Under his direction, the leaching and electrolytic plant was later built at Inspiration.

BUT before undertaking construction of the Inspiration leaching unit, Dr. Ricketts had taken part in another enterprise—the New Cornelia, at Ajo—a connection which probably had much to do with the success of leaching at Inspiration. Dr. Ricketts directed the development of this method at Ajo, and under his direction Mr. McGregor designed that pioneer installation. In this undertaking, Dr. Ricketts was again associated with General Greenway. These two—Greenway and Ricketts—were also associated in the development of the Erupcion and Ahumada lead mines, in Chihuahua.

Although Dr. Ricketts has done most of his work in the American Southwest and in the adjoining northern section of Mexico, he is not without experience in other parts of the world. At various times he has acted as consultant to Anaconda Copper and its two Chilean subsidiaries, Andes Copper and Chile Copper. In fact, it was largely confidence in Dr. Ricketts' advice that led to the development of Andes' large low-grade deposit at Potrerillos, where a concentrator, smelter, leaching plant, and refinery are now in operation. He has taken part in important projects outside the mining field as well. With C. E. Mills he organized the Valley Bank, Arizona's largest financial institution, and on Mr. Mills' recent and untimely death, Dr. Ricketts succeeded him as president. Under his leadership the Horse Mesa Dam was made possible. Inspiration's contract for hydro-electric power from that enterprise assures water users of the Salt River Valley an annual revenue that will bear the entire cost of this great reclamation plan. Finally, he was one of the founders of the organization that signalled him out for honor—the Arizona Industrial Congress, in the formation of which he has displayed consistent interest and given personal service.

Dr. Ricketts prefers to consider himself at least partly retired, though his retirement is busier than many men's careers. He still retains a directorship in Greene Cananea, Inspiration, and New Cornelia, as well as the presidency of the Valley Bank, but he has resigned his other offices and lives quietly in Pasadena, Calif., not far from the great mines in the development of which he played so important a rôle.

Copper in North Carolina

By H. J. Bryson
State Geologist of North Carolina, Raleigh, N. C.

THE date of the discovery of copper in North Carolina is not known, but the ore was probably recognized soon after the first gold mine was opened, in 1799. Emmons states in his report of 1852 that "it has been known for a long time that the auriferous pyrites consist in part of the sulphuret of iron, and, in part of the sulphuret of copper. In extracting the gold from the sulphurets, the latter has been neglected and allowed to flow away in the washings. Lately, however, attempts have been made, not only to save the copper of the auriferous pyrites, but to work the veins exclusively for copper." Evidently, the copper was known years before an attempt was made to work it on a commercial scale; also, copper was first produced in North Carolina about the middle of the last century. The first mine to be worked successfully for copper was the Stith mine, later known as the Fentress mine, situated in the southeastern part of Guilford County. The success of this mine resulted in several others being worked exclusively for copper.

Copper ores are known to occur at numerous places in North Carolina. The chief areas which have produced in varying amounts follow:

1. Syenitic belt which includes parts of Guilford, Cabarrus, and Mecklenburg counties.

2. Central Huronian belt which includes principally Rowan, Davidson, and Randolph counties. Chatham and Alamance counties, however, have small areas which contain the same types of ores.

3. Virgilina or Blue Wing district in Person and Granville counties, in North Carolina and extending into Virginia.

4. Western or Mountain district which includes all of the mines in North Carolina west of the Piedmont section.

Syenitic Belt

In the syenitic belt most of the mines in the early days were worked for gold. Owing to the fact that considerable copper occurred in them, they later became copper mines. In the southern part of Guilford County a few very productive mines were operated. In Cabarrus and Mecklenburg counties the mines were not so productive. Rocks of this belt, as the name indicates, are principally syenite. The best producing mines, however, were situated near the eastern contact of the belt with the schists and slates, in an area known as the Huronian slate belt. Near the surface large orebodies were extracted, but at depth results were not so favorable. Reliable records and maps relating to this district were not kept, and as a result little is known of these mines, the ore from which was chiefly chalcopyrite, but malachite and the red oxide of copper were also found. The chief gangue mineral was quartz, with varying amounts of manganese, siderite, pyrite, and limonite. Veins varied in width from a few inches up to 25 ft. and averaged about 4 or 5 ft.

The Central Huronian copper belt is probably the widest and best-known district in the state. It lies to the east of the syenitic belt and extends from Rowan County eastward to Chatham. Mining in this belt began about 1824. Rocks of this entire area consist of highly metamorphosed, coarse and fine, acid volcanic tuffs. During the deposition of these rocks, land waste was intermixed. Metamorphism has been so intense that it is difficult to determine where one type of rock stops and the other begins. The older rocks are cut with numerous dikes, which are so abundant at certain points that the whole formation assumes a bedded appearance. Ores are chiefly auriferous pyrite and chalcopyrite. Sometimes quartz, the chief gangue mineral, includes free gold as well as chalcopyrite. Laney states that two periods of mineralization are evident: the first, when the high-gold low-copper ore was produced, and the second producing high-copper low-gold ore.

Virgilina District

The Virgilina copper district is situated near the eastern border of the Piedmont plateau in Person and Granville counties of North Carolina, and in Halifax and Charlotte counties of Virginia, each state including about one-half of the ore-bearing area. Rocks of this area are decidedly schistose and are locally known as slates. They are chiefly of two types—namely, greenstone schists and quartzose sericite and gneisses. Into these schistose rocks have been intruded large masses of granite and less important masses of a basic material, probably gabbro. Ores of this belt consist almost wholly of bornite and chalcocite, together with the oxidized products derived from them. Chalcopyrite is present rarely and then only in small quantities. Veins are of quartz, and occasionally contain considerable epidote and calcite. In width they vary from small stringers of a few inches up to 15 or 20 ft. In length they range from a few hundred yards to four or five miles. Vertically they extend to the bottom of the deepest mines, which are bottomed at 400 to 500 ft.

The Mountain District

Copper ores are widely distributed through the western part of the state, but occur chiefly in Ashe, Jackson, and Swain counties. In Ashe County the rocks of the area are the characteristic gneisses and schists. The gneisses are light or dark gray in color and usually contain a great deal of hornblende. Ore in the old mines of this county contains malachite, chrysocolla, some chalcopyrite, and the brown copper oxide. Iron pyrite is almost wanting. The veins usually increase in width with depth. The copper belt of Jackson County occupies the middle portion of the county and can be traced into Haywood. Rocks of this area are hornblende schists, gneisses, and syenites. Old mines of this belt offer possibilities for development. Ore of these mines is chiefly chalcopyrite, with some carbonates and silicates near the surface.

The copper belt of Swain County is probably an extension of the Tennessee belt. Rocks of this region may be described under the following four divisions:

slate, conglomerate, graywacke, and igneous rock, probably a diorite. All of these rocks belong to the Ocoee formations and are probably of Cambrian age. The slates are a dense black, carrying varying amounts of iron sulphide. They are cut by numerous quartz veins, which usually are small, although rarely quite large The veins generally follow in trend the schistosity of the slate, but often they follow the joints in the rock. Overlying the slates are the conglomerates, which consist mostly of clear to clear blue quartz pebbles subangular to well rounded in shape. This formation can be traced from the northeastern end of Swain County southwestward through Graham and Cherokee counties down into Tennessee. The conglomerate grades into the graywacke, a shalg micaceous sandstone, which in turn grades into a slate. Beds of graywacke are also intersected by numerous quartz veins in the same manner as the slates. The copper-bearing vein varies in width from 2 to 30 ft. or more. Ore is chalcopyrite, with small amounts of native copper, tenorite, malachite, azurite, as well as small amounts of gold and silver. The vein dips at an angle of about 60 deg. to the southeast; on the hanging wall the typical dark-colored slate is found, and on the footwall a sort of talcose slate occurs, which gave some trouble in the smelting of the ore. Copper ores of this belt do not occur in true fissure veins, but rather as replacements of the "slates." This has taken place along fractures, fissures, and other structural features of the slates which were favorable to the circulation of the mineralizing solutions. This copper belt is about 30 miles long, but up to the present only two areas have been prospected extensively. The most important deposit is owned and operated by the Fontana Copper Company and is situated on Eagle Creek. The other deposit, which is now being thoroughly prospected, occurs on Hazel Creek, about ten miles to the northeast of the Fontana Copper Company's property. These two deposits are the most important copper occurrences known in the state.

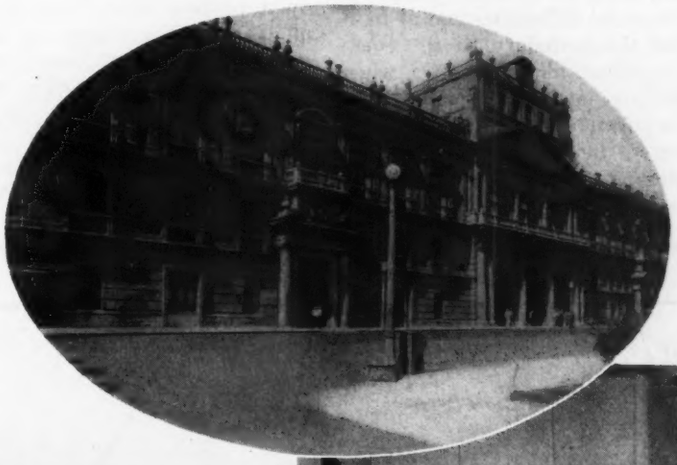
Production of copper in North Carolina since 1900, the first year statistics were kept, follows:

Year	Pounds	Value
1900	.....	$41,600
1901	512,666	76,900
1902	1,417,020	212,553
1903	458,133	67,037
1904	305,000	36,600
1905	488,888	88,000
1906	703,775	135,829
1907	597,878	116,416
1908	19,393	2,560
1909	224,512	29,186
1910	140,514	17,845
1911a	.....	.....
1912	63,766	10,521
1913a	.....	.....
1914	20,434	2,718
1915	17,170	3,005
1916	9,800	2,411
1917	124,991	34,123
1918a	.....	.....
1919	3,334	b
1920a	.....	.....
1921a	.....	.....
1922a	.....	.....
1923	61,983	b
1924a	.....	.....
1925a	.....	.....
1926	1,468,796	b
1927	5,443,115	b

a No production reported for these years.
b Only one producer; value of output not available.

Making Mining Engineers in Mexico

Below—The chemical laboratory is equipped with up-to-date apparatus



In the oval—The school of engineering building at the University of Mexico, in Mexico City

Above—The metallurgical laboratory in the school of engineering, where young Mexicans make the acquaintance of flotation

THE FOREST OF DEAN

One of the Oldest Productive Properties

By H. D. KEISER

Assistant Editor

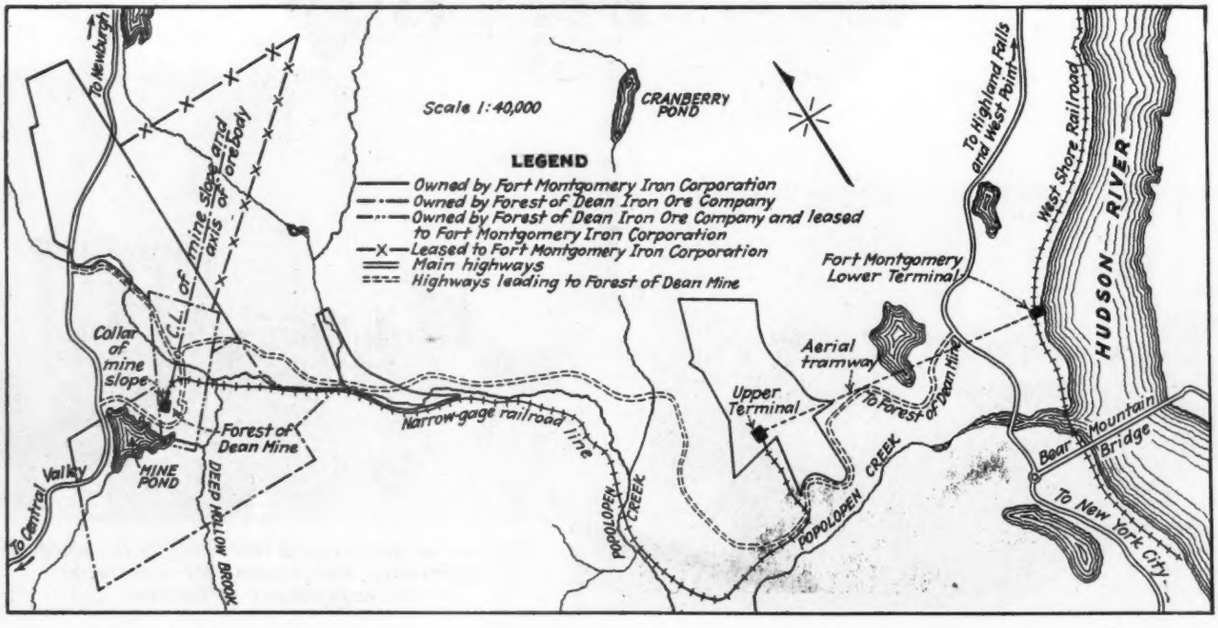
ONE of the oldest productive mining properties in the United States is the Forest of Dean iron mine, situated 5 miles west of Fort Montgomery and 43 miles northwest of New York City in the Hudson Highlands of the State of New York. Operated as early as 1756, the property has considerable historical background. According to early records, the troops of Anthony Wayne were encamped there prior to the attack on Stony Point, and it is said that part of the iron chain swung across the Hudson River at Fort Montgomery during the Revolutionary War was made from ore mined at the property.

Although a complete record of operations prior to 1865 is not available, mined-out portions of the property indicate that total production has been about 2,000,000 tons of ore. In 1865, the Forest of Dean Iron Ore Company was incorporated to purchase and operate the property. Production by this company amounted to 500,000 tons, and continued until 1894, when operations were suspended owing to financial difficulties and as mining had practically reached the boundary of the tract. The mine was closed and remained idle until 1905, when the Hudson Iron Ore Company, later reorganized as the Fort Montgomery Iron Corporation, which is now operating the property, unwatered the mine. Shipping was resumed the following summer. This company leased

All of the water flowing into the mine is raised with this Cornish pump—one of the few, if not the last, of such pumps in use in this country

on a royalty basis from the Forest of Dean company all plant and workings on the tract, and also a 3½-mile narrow-gage railroad line. In addition, a tract adjoining the Forest of Dean property and containing the continuation of the mine orebody was leased. Under the administration of the Forest of Dean company the property was operated entirely by water power; mule haulage was used on the narrow-gage line, and wagon transport between the railroad terminus and a dock at Fort Montgomery. At this point the ore was moved in wheelbar-

Sketch map showing holdings of the Fort Montgomery Iron Corporation


To Newburgh
Scale 1:40,000
CRANBERRY POND
LEGEND
Owned by Fort Montgomery Iron Corporation
Owned by Forest of Dean Iron Ore Company
Owned by Forest of Dean Iron Ore Company and leased to Fort Montgomery Iron Corporation
Leased to Fort Montgomery Iron Corporation
Main highways
Highways leading to Forest of Dean Mine
To Highland Falls and West Point
West Shore Railroad
HUDSON RIVER
Fort Montgomery Lower Terminal
Aerial tramway
To Forest of Dean Mine
Upper Terminal
Collar of mine slope
Line of mine slope and axis of orebody
Forest of Dean Mine
Narrow-gage railroad line
MINE POND
DEEP HOLLOW BROOK
POPOLOPEN CREEK
POPOLOPEN CREEK
Bear Mountain Bridge
To New York City
To Central Valley

MINE . . . . .

in the United States

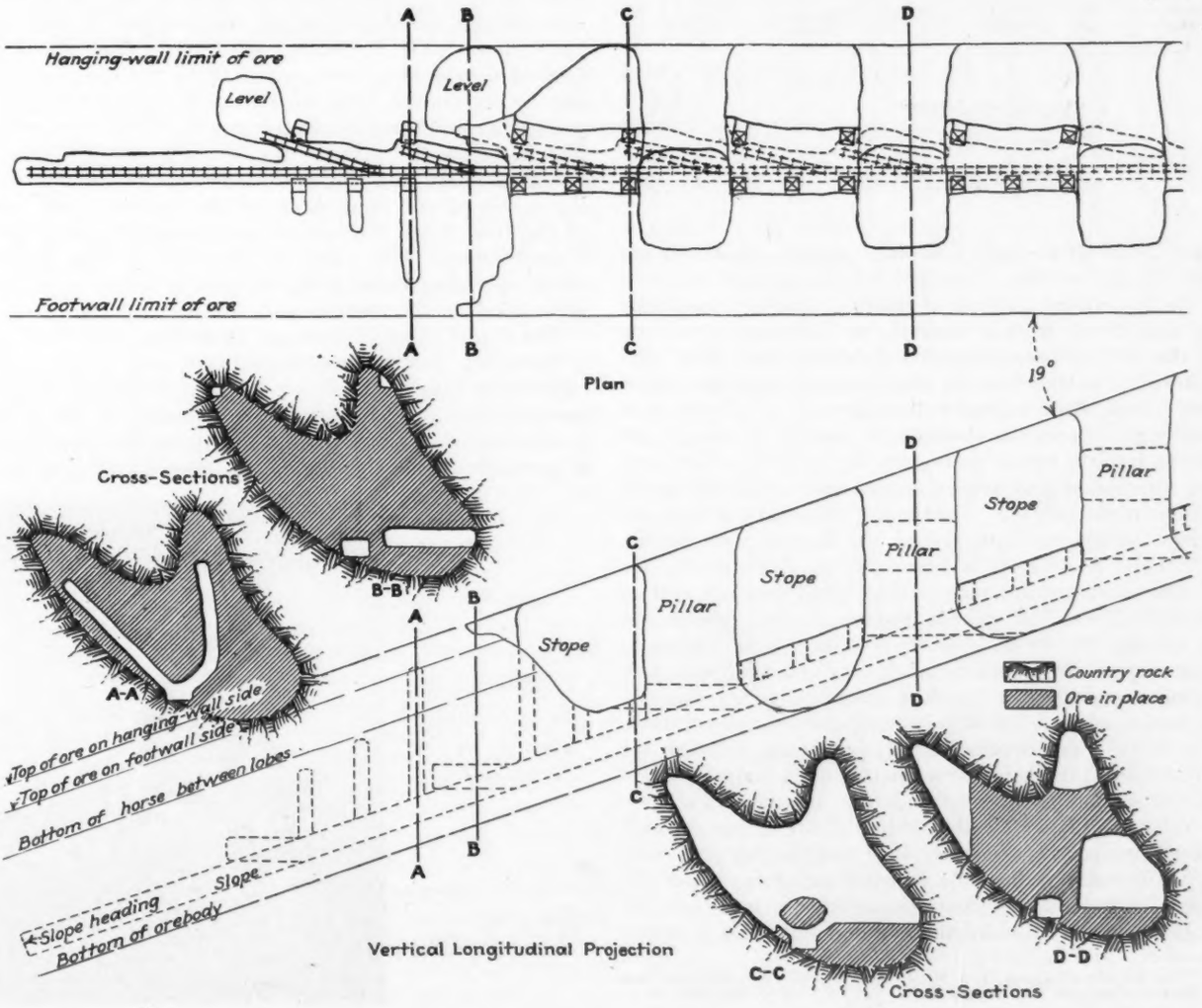
SITUATED NEAR FORT MONTGOMERY, NEW YORK, *in a district rich in historical background, this property has been a source of high-grade iron ore since 1756. General characteristics of the orebody have changed but slightly at depth, its size and unusual shape persisting into the current workings of the Fort Montgomery Iron Corporation. The mine possesses several unusual features, including the use of three kinds of power for prime movers—namely, water, steam, and electricity. A compressor is driven by a Pelton water wheel, hoisting is by steam, and the concentrator is electrically operated throughout.*

rows to barges, which conveyed it to furnaces at Poughkeepsie, N. Y. The Fort Montgomery company extended the narrow-gage line a half mile and erected a cable tramway between the eastern end of the railroad line and the Hudson River. Present holdings and transportation facilities of the Fort Montgomery Iron Ore Company are shown in the accompanying sketch map.

The orebody is a high-grade magnetite of practically uniform quality that averages about 56 per cent iron and 1 per cent phosphorus. Pitching at an angle of about 19 deg. toward the northeast, the deposit, which is approximately 100 ft. in width and 100 ft. in thickness, apparently occupies the trough of a synclinal fold overturned to the northwest.[1] A horse of rock divides the orebody

[1] "The Magnetite Iron Deposits of Southeastern New York." The New York State Museum, Albany, N. Y. By R. J. Colony; 1923.

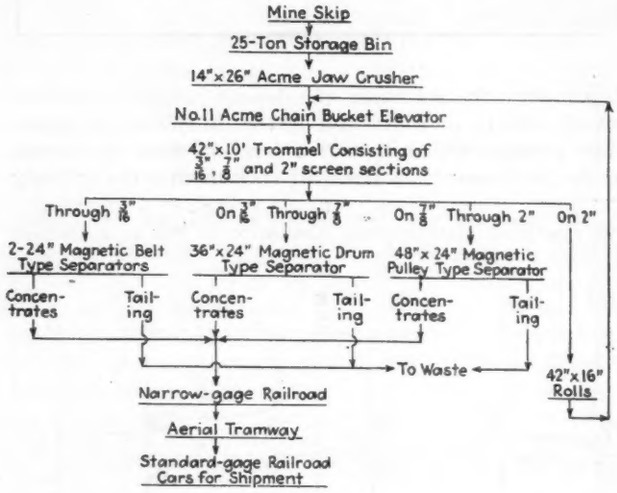
Idealized sketches of lower end of the workings at the Forest of Dean mine



at the top into two lobes, so that a cross-section of the deposit is heart shaped. The persistency of the form, size, and pitch of the deposit at depth is one of the most remarkable features of the mine, so much so that no exploratory drilling is done in advance of extraction operations.

Mining operations are carried on through an inclined shaft or slope, 5,100 ft. in length, driven in the lower portion of the orebody. Formerly,[2] and until 1915, the ore was mined by a pillar-and-breast-stoping method. All the ore was shoveled by hand into skips. These were brought into the stopes from the hoisting track in the slope by means of a fan-like arrangement of trackage laid on the level floors of the stopes. As mining progressed, the slope and slope track were advanced at intervals to leave a pillar and an arch of ore from the pillar to the hanging wall. A new stope with a working face 20 to 30 ft. high was then begun. About 60 per cent of the ore was recovered by this method.

Flow sheet of the concentrator



In the current method of mining, which is essentially an underhand stoping method, an increased extraction of the ore has been effected and mining costs have been lowered. As shown in the accompanying sketches, extension of the slope is kept well in advance of all the other workings. From the slope 65-ft. raises 6 ft. square are driven into the upper portion of the orebody, where they are intersected and opened at the top by the advancing bench in the stopes. The ore is then blasted into the raises, which are equipped at the bottom with chutes. Through these the ore is drawn off into skips and hoisted to the concentration plant. The small heading carried on each side of the stope at the top of the orebody aids in cutting the bench and the pillars. Five chutes in each stope reduce handling of the ore to a minimum, and, owing to switches in the slope track, an empty skip can be loaded while a full skip is being hoisted and returned. The slope is equipped with only one track, as room for an additional track is not available in the major portion of the section passing through the old workings.

What are known locally as "levels" are driven through the pillar area between the slope and the hanging wall, so as to intersect the first hanging-wall raise below the pillar. The level provides a passageway to and from the stope as soon as the ore surrounding this raise is stoped

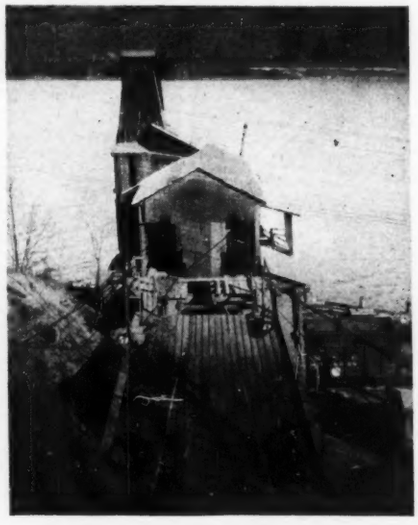
[2]"The Forest of Dean Iron Mine, New York." *Engineering and Mining Journal*, Vol. 85, pp. 1091-93. By Guy C. Stoltz.

The magnetic concentration plant and slope track leading underground

down to its elevation. Ore in the floor of the levels, some of which is below the slope track, is mined last and is trammed by hand to the nearest chute on the hanging-wall side. Roof and walls usually require no additional support, but they must be given constant attention, owing to scaling. Although future operations may include the removal of pillars, no attempt to extract them has been made as yet.

Another exceptional feature of the mine is its comparative dryness. Total water pumped is but 50 g.p.m., even though the slope heading has reached a depth of more than 1,000 ft. below sea level. This water is relayed up the slope to a sump along the hanging-wall side by six pumps, three of which are operated by compressed air and three by electric power. From this point, 250 ft. below the surface, the water is raised through a vertical shaft by a Cornish pump—one of the interesting pieces of old equipment on the property, and one of the few, if not the last, of such pumps in use in the United States. The pump is driven by a 6-ft. Pelton wheel operating under a 60-ft. head of water from the mine pond on the western part of the property.

The 5-ton skips of ore are hauled up the slope by a Nordberg first-motion single-drum steam hoist, the cable from which passes over a sheave in the top of the concentration plant. Direction of motion of the cable is reversed in passing over the sheave, as the hoist house is vertically above the slope. As shown in the accom-



Lower terminal of the cable tramway situated on the Hudson River

panying flow sheet, the ore is first crushed and then screened in a three-size trommel, the oversize from which is ground in rolls and returned to the trommel. The screened products pass to three magnetic separators, which produce a concentrate averaging 63 per cent iron and 0.5 per cent phosphorus. The tailing contains about 8 per cent iron. Recovery is at the rate of 1 ton of concentrate per 1.2 tons of ore. All equipment in the concentration plant is operated by electric power. Concentrate is loaded into 6½-ton cars and transported 4 miles over a 3-ft.-gage steam railroad line to a 100-ton loading pocket at the upper end of a cable tramway. From this point it is carried 6,000 ft. in ½-ton buckets to the lower terminal of the tramway situated on the Hudson River and the West Shore Railroad. Here loading pockets of 500 tons' total capacity discharge into river barges and railroad cars. All shipments in the last few years, however, have been by rail. Coal for steam generation purposes at the mine is transported in the opposite direction over the tramway and narrow-gage railroad.

W. A. RIGBY
mine superintendent

At present 275 tons of ore is being mined daily on a two-shift basis. An underground force of 40 men is employed, and six rock drills are operated. Each foot advance of the average stope face yields 400 tons of concentrates. Thirty per cent gelatine dynamite is used in the stopes, and 40 per cent in development work. For the last five years dynamite consumption per ton of concentrates has averaged 1.058 lb., and the cost of explosives, including caps and fuse, 16c. Ratio of production to labor in the last eight years has been 2.55 tons of concentrates per man-shift; this figure includes all labor employed. Shipments during this period have been made to fourteen different blast furnaces in New York, New Jersey, and Pennsylvania. Annual capacity of the plant as equipped and when operated on a two-shift basis is from 80,000 to 90,000 long tons of concentrates.

I am indebted to C. M. Stanford, secretary and treasurer of the Fort Montgomery Iron Corporation, for permission to visit the Forest of Dean mine and to prepare the foregoing account. Acknowledgment is also gratefully made to W. A. Rigby, mine superintendent, who supplied the drawings and facts presented in this article, and who was a most cordial and entertaining host at the time of my recent visit to the mining property.

Electro-Magnetic Separator and Electric Furnace Produce Hard Facing Metal From Black Sands

TWO SPECIAL ALLOYS have been developed recently by the Commercial Alloy Corporation, of San Francisco, known as Cristite Series 1 and Cristite Series 3. The former shows a hardness on the Rockwell C scale of 61 to 67, whereas Cristite Series 3 shows a hardness of 49 to 55. Either of these alloys can be easily flow on to a steel surface by means of ordinary welding equipment and both are available in the form of rods for this purpose. Cristite Series 1 is being used for facing earth-boring tools, airplane valves, and airplane tailskids, and for facing hammers of grinding and crushing equipment. It has also found a field of usefulness in oil-well equipment, such as boring tools and oil-pump valve seats. Series 3 alloy is being used for hard facing of crushing mills and railroad crossings. It withstands impact much better than does Series 1, which contains tungsten and is more brittle. Commercial production of these special metals is the outcome of a process devised by Don M. Crist for the production of steel from black sand. In carrying out the process, black sand is passed over an electro-magnetic separator, which consists of a superimposed series of electro-magnets on an inclined vertical plane. The sand flows down over face-plates magnetized to a different intensity by means of a rheostat-controlled electric current. This separator, devised for separation of the sand into materials useful in steel manufacture, originally consisted of sixteen individual steps, each for the separation of magnetite, martite, chromite, ilmenite, and residue. In the manufacture of the special alloys only four steps are necessary, the material being passed through several times to gain a complete separation. The magnetite is then roasted and reduced. It is first mixed with tungsten ore, gas coke, and hot molasses, and this mixture is then briquetted and extruded into 1-in. rods, 24 in. long. These rods are baked for five hours in an oven at 240 deg. F., and are then used as auxiliary electrodes, six in number, working in a three-phase, alternating-current furnace, in parallel with three graphite electrodes. The graphite electrodes are carried under a potential of 40 volts; the voltage on the auxiliary electrodes is 90. Current consumption is about 300 amp. The furnace lining is magnesite.

Reduction takes place in this furnace at a high temperature very rapidly, thereby avoiding volatilization. After the reduction operation is complete the charge is poured into a Heroult refining furnace. It is then poured into moulds and delivered as finished product in the form of welding rods.

A microphotograph of a Cristite-faced surface on mild steel shows a good penetration of the metal into the steel surface, and this apparently is produced easily by ordinary welding methods. The section also shows the density and crystalline structure of the alloy.

Used as a facing on the hammers of grinding mills it greatly lengthens the life of the hammer. It has also been found greatly to increase the service which can be obtained from an airplane tailskid, and makes an extremely hard and long wearing surface, of lower frictional resistance than that of softer metal.

KAMPAR DREDGE

Designed and Constructed in California

STARTS OPERATIONS

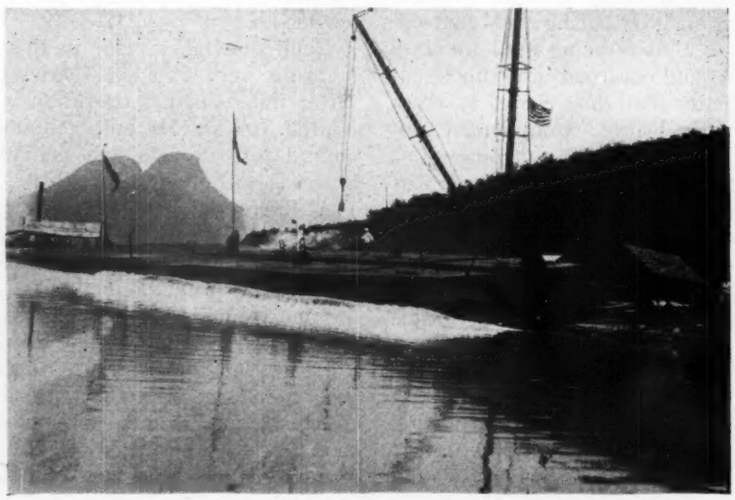
IN MALAYA

By L. H. Eddy

KAMPAR DREDGE was designed by the engineers of the Yuba Manufacturing Company, of San Francisco, Calif., for the Kampar Malaya Tin Dredging, Ltd. The designing and construction were done at the works of Yuba Manufacturing Company in Marysville, Calif. This dredge is the first of a number of dredges to be designed and constructed for Malaya. Yukon Gold Dredging Company built in 1923 a large bucket dredge to work a stanniferous deposit near Kampar. The dredge was erected at Kampar under the management of the Anglo-Oriental (Malaya), Ltd., of which company Gerald H. Hutton is general manager, with headquarters at Ipoh, Federated Malay States. Erection of the dredge was under the supervision of Paul E. Morse, superintendent with the Yuba Manufacturing Company for several years, and who has present supervision of dredge erection work in the Malayan field. Erection tools and equipment were supplied by the managing company. The labor was performed by Chinese under contract. The hull was launched on Sept. 30, 1928. Yuba Associated Engineers of San Francisco are supervising engineers in charge of operations of the mining enterprises of the Anglo-Oriental Group. The Anglo-Oriental Mining Corporation, Ltd., of London, has extensive plans in view to improve the general dredging conditions in the Far East, and there reduce the cost of production of tin. This program contemplates the construction of several additional modern tin-digging dredges. Yuba Associated Engineers are now engaged in designing dredges for installation in the Lower Perak field, where the alluvial deposits are said to be in excess of one hundred feet in depth. Kampar Malaya Tin Dredging, Ltd., is a subsidiary of the London Malayan Tin Trust, Ltd., of London, which was recently founded by the Anglo-Oriental Mining Corporation, Ltd. The property of the Kampar Malaya Tin Dredging, Ltd., is situated on the Kampar River, in the Kenta Valley, Federated Malay States. The dimensions of the Kampar dredge are: Length of all-steel hull, 180 ft.; breadth of beam, 48 ft. forward of main gantry and 60 ft. aft of main gantry. Length of digging ladder, 151½ ft. The dimensions of the hopper are 5 x 11 x 18 ft. Length of stacking sluices, two of 140 ft. each, used for jig tailings, and one of 65 ft., used for screen rejects. These two sluices are situated one on either side of the dredge deck. The number of 10-cu.ft. buckets in the bucket line is 118. The dredge is capable of digging at a depth of 75 ft. Its revolving screen is 47½ ft. long and 8 ft. in diameter. The diameter of the screen perforations in all except the last section is $\frac{5}{16}$ in. to $\frac{7}{16}$ in. In the last section, the perforations are $\frac{7}{16}$ in. to $\frac{9}{16}$ in. All screen perforations except the last section are tapered $\frac{5}{16}$ in. to $\frac{7}{16}$ in. In the last section, the perforations are tapered $\frac{7}{16}$ in. to $\frac{9}{16}$ in. The material which is washed through these perforations is distributed equally to twelve roughing jigs, six of which are placed on each side of the dredge deck.

Hutch products from each set of six jigs are sluiced by gravity to hutch tanks placed near the stern of the dredge. From each of the hutch tanks the material is elevated by sand pumps to large dewatering cones located near the hutch tanks. Solid material which settles in each of these dewatering cones is then treated on clean-up jigs. The hutch products from the first cell of the clean-up jig are carried ashore for further treatment in the tin sheds, and the remainder of the hutch products from the clean-up jigs is led back to hutch tanks for further treatment. Tailing from the roughing jigs, and also that from the clean-up jigs, pass on to a main longitudinal flume placed on each side of the dredge deck. In the tin sheds the hutch product is further concentrated by the expert natives who have had long years of practice in cleaning the tinstone. Marketable black tinstone from the Malaya fields contains from 70 to 72 per cent metallic tin. The best brands of tin

Launching the Kampar dredge



are those obtained by smelting tinstone concentrates obtained from alluvial deposits, because from these deposits the common impurities have been removed by natural processes consisting of the decomposition of the metalliferous impurities by air and percolating waters.

Tinstone is a commonly used name for cassiterite or oxide of tin, SnO_2, and when chemically pure has a metallic tin content of 78.6 per cent. The most common impurities of the tin ore are iron and tantalum, and the stone is usually a deep brown or black color. The specific gravity of tinstone varies from 6.5 to 7.1, but it can readily be separated from the other minerals in sluice boxes, by panning, or on shaking tables.

Designs for the construction of this dredge were completed and in hand in January, 1928. The material was designed so that the dredge could be erected instead of constructed in the field.

The first shipment to Kampar, Federated Malay States, of this material was made on March 1, 1928; the second shipment was made March 30, 1928; and the dredge all-steel hull was launched on Sept. 30, 1928. Thus the total lapsed time required for designing, construction, and assembling this dredge amounted to about 270 days. In other words, the designs were in hand in January, 1928, and the dredge was in commission and began immediate operation on May 6, 1929.

Utilizing Staining Methods in the Identification of Minerals

By R. E. Head[1] and A. L. Crawford[2]

AT THE microscopic laboratory of the U. S. Bureau of Mines Intermountain Experiment Station, Salt Lake City, Utah, efforts are being made to devise methods of differentially coloring finely crushed minerals as a means for their identification. Staining would facilitate sight recognition of minerals under the microscope and would be of great value in the study of crushed ores, concentrates, and tailings. Inasmuch as the treatment of ores for their beneficiation is primarily based on the recovery of the minerals containing the elements of value, it is extremely important that these minerals should be known and that a method for quickly determining them when in minute fragments should be available. Herein lies one of the greatest uses for color methods.

Frequently it is a difficult matter for even the trained petrographer and mineralogist to identify finely crushed minerals quickly. Although ordinary petrographic methods are accurate, they are often time-consuming and are not suitable to the needs of millmen who require, especially in the examination of tailing, a method for determining minerals by inspection. By selectively altering the surface of certain minerals, through the use of agents that cause discoloration or produce other outstanding changes that are characteristic and recognizable at sight, it has been sought to differentiate them from associated minerals by their color or other distinctive appearance.

Cerussite and anglesite are the chief components of the oxidized lead ores and are often minor constituents of predominantly sulphide ores. Failure to recover these minerals, more than any other cause, has been responsible for the losses sustained in the milling of oxidized lead ores, although plumbojarosite[3], a mineral that is common in certain localities, has been a contributing factor in some instances. A method by which cerussite and anglesite can be recognized instantaneously in a ground concentrate or tailing should be of great value to the mill operator, as it would enable him to check the performance of concentration machines by the examination of concentrates and tailings at regular intervals. By applying the color method described in this paper, the experienced operator should be able to interpret the relative abundance of cerussite and anglesite found in the tailing in terms of percentage of lead so closely as nearly to approach the accuracy of chemical analysis.

The most serviceable test developed thus far to distinguish lead sulphate and lead carbonate is based upon the well-known quantitative test for lead in solution by the production of the yellow insoluble lead chromate. A procedure for producing this precipitate on the mineral surface has been standardized for the determination of both cerussite and anglesite in the crushed condition. Either of these minerals can be selectively chromated in the presence of the other, and one or both of them can be chromated without interference when in the presence of other minerals with which they are usually associated. The test is simple to apply, rapid in its action, conspicuous for its color, permanent in its effects, and can be used to equal advantage by the mill operator and the experienced mineralogist. An outline of the procedure follows:

1. To produce a bright yellow coating of lead chromate of equal intensity on both cerussite and anglesite, the mineral grains are treated with a cold saturated aqueous solution of potassium bichromate for fifteen minutes.

2. Anglesite in the presence of cerussite is chromated by a cold aqueous solution containing 2 per cent potassium bichromate and 0.5 per cent sodium hydroxide for one minute.

3. Cerussite in the presence of anglesite is chromated in one minute by a cold 1 per cent solution of chromium trioxide. In this latter case, a solution too strong or too long applied will decompose any galena present. However, when the reagent is applied in the manner stated, the galena shows only an orange-colored tarnish which is readily distinguished from the bright lemon-yellow coat on the cerussite.

Chromating is best accomplished by placing the sample in a watch glass, applying the reagent, and gently giving the watch glass a circular motion to insure that all the grains are thoroughly wetted by the liquid. Particles of anglesite or cerussite that are not completely wetted and float on the surface of the solution will be chromated on one side only, and if the chromated faces of such particles were turned away from the observer upon subsequent examination they would probably be passed over unnoticed or be classified as middling grains.

This paper represents work done under a co-operative agreement between the U. S. Bureau of Mines and the University of Utah. Printed by permission of the Director, U. S. Bureau of Mines.

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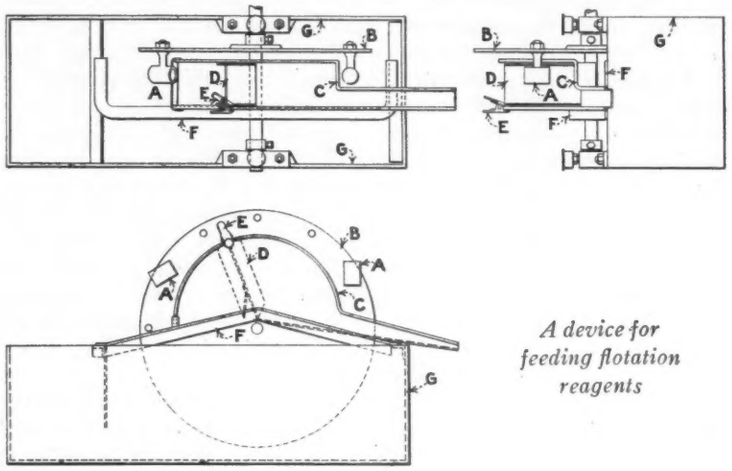
[3]Head, R. E., and Miller, Virgil: "The Occurrence of Jarosite Minerals in Oxidized Lead Ores as a Factor in Metal Losses." Reports of Investigations, Serial 2870, U. S. Bureau of Mines.

USEFUL OPERATING IDEAS

Reagent Feeder Adaptable to Flotation Needs

By Alfred B. Sabin
Deming, N. M.

THE accompanying illustration shows a reagent feeder which I have worked out for the Peru mill of the Illinois Zinc Company at Deming, N. M. This feeder is simple in design and adaptable to general requirements of the flotation process. It is designed to feed any liquid at a constant rate, which may be easily adjusted. The cups, *A*, rigidly attached to a revolving disk, *B*, scoop up the liquid from the tank below, and, as they rise, tilt, dumping their contents into a trough, *C*, which discharges wherever desired. The bottom of the trough extends only to the center of the disk. All liquid discharged from the cup before it reaches the movable trough, *D*, is returned to the tank *G*. Trough *D* is held in any position of the arc by the spring clip *E*. Further adjustment may be had by changing the number or size of the cups.



A device for feeding flotation reagents

Trough *C* is welded on one side to the angle iron *F*, which rests on supports in tank *G*, permitting easy removal.

Hints on Babbitting Bearings

By Charles Labbe

TO BABBITT several lineshaft bearings and make a clean, quick, and accurate job, I employ the following method: Select one half bearing which is apparently the least worn of the lot; melt the babbitt off all the others and clean the shells with a wire brush. Take a mandrel of the same diameter as the shaft and an inch or so longer than the bearing; polish it with emery cloth; warm it, and place it in the half bearing. Note how it is for center line, and if worn too deeply place a piece of heavy paper between babbitt and mandrel. Cut shims of cardboard and lay the babbitted half bearing over two blocks, mandrel in and flush at one end and a shim on each side. Cut a little piece of soft wood about $\frac{3}{8}$ in. cube (a trial or two will show the size required); place it at the center. Its purpose is to hold the mandrel tightly.

Have the other bearing halves warm. Take one, turn it over to rest on the little piece of wood, and, with a C-clamp, fasten the whole—the half bearing to be babbitted, the mandrel, shims, and the babbitted half. A couple of light taps with the hammer are sufficient to center and even up the side. Stand it upon an iron plate, and with putty or clay daub the outside around the bottom, after which the hot babbitt can be poured. As soon as it has set, loosen the C-clamp and the bearing is finished. All the other half bearings can now be babbitted in a surprisingly short time. The old one, which was kept as a starter, can be melted out and poured by using a finished half.

Pouring babbitt endwise is always best whenever possible, as it makes a neater job, and any scum that may arise is cut out in trimming. Never oil the mandrel, as to do so causes bubble holes; and keep the mandrel well polished, as it gives the same finish to the babbitt. The castings should be warm enough to steam off water.

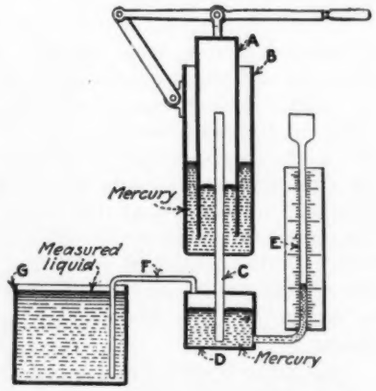
Accurate Measurement of Liquid in Tanks

THE crude and inconvenient "dip rod" can be economically replaced by simple pneumatic liquid measurement instruments in many cases, according to J. M. Brennan, in *Chemical & Metallurgical Engineering*. Such devices utilize the pressure head of a liquid in a container and of course do not measure the actual depth of the liquid. Readings, however, give an accurate measure of the depth when the instrument is calibrated for a liquid of the same specific gravity as that for which it is to be used. As the head of a given quantity of liquid is independent of the variations in volume due to temperature, no temperature correction need be made when such instruments are used for indicating the depth of liquid in a tank. The indicating scale may be calibrated for both depth and quality measurements when the tank is of reasonably uniform cross-section.

The principle of pressure head measuring devices is easily explained. An open-end tube is immersed to the bottom of a vessel containing a liquid. The other end of the tube is connected to a manometer or other pressure indicator. Air is introduced to completely fill the tube and balance the pressure head, whereupn the column of liquid in the manometer immediately rises to a height exactly equal to the depth of the liquid in the vessel provided liquids of equal densities are used; or the manometer shows a proportional height if the specific gravities vary.

In the operation of such instruments, provision must be made for pumping air through the tube to compensate for air loss. Besides, the small volume of air retained must be hermetically sealed in

Fig. 1—Pneumatic gage showing mercury compressor, manometer and air pipe



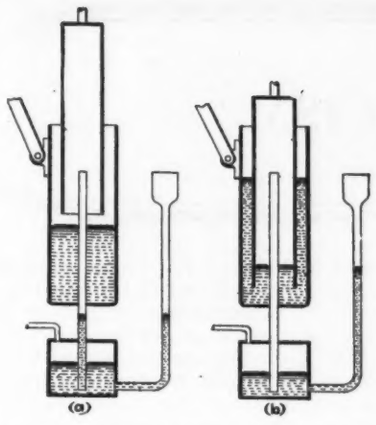


Fig. 2—Showing action of the mercury compressor

At (a) the bell is withdrawn and filled with air at atmospheric pressure. At (b) the bell is lowered, forcing air into the seal chamber.

the line tube to effect a correct reading. By permanently maintaining this air column between the measuring instrument and the tank measured, direct liquid connection with the instrument is avoided.

The introduction of air and the maintenance of a leakproof air seal have presented considerable difficulty in instruments of this type. The apparatus to be described precludes the use of the ordinary air pump, with its various easily deranged parts. At the same time, it meets that important requirement, an absolute air seal.

The device shown in Fig. 1 consists of a pump chamber *B* and a seal chamber *D*. The requisite amount of mercury is placed in each chamber. To fill them, plug holes are so located that only the exact amount of mercury can be supplied, thus assuring the correct mercury height.

Two additional operating positions of the pump are shown diagrammatically in Fig. 2 at *a* and *b*. From the top of the lower or seal chamber *D*, a connection is made to the air line *F* leading to the tank *G*. The glass tube *E* is connected to the bottom of the seal chamber and may be terminated with a cup to retain the excess mercury flowing from the seal chamber in case of excess pressure such as would occur if the air line should become plugged.

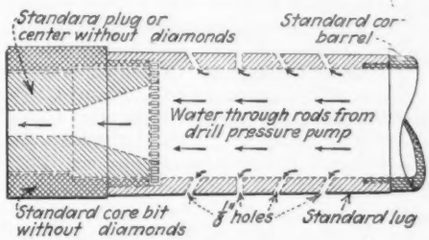
Operation of the air compressor is as follows: The bell tube *A* sliding in the mercury cylinder *B* is raised as in Fig. 2 *a* until its open end is above the mercury in *B*. This permits air at atmospheric pressure to enter the bell. On depressing the lever the bell tube compresses the air and forces it through the central air tube *C*. As the end of this pipe is immersed in the mercury in the seal chamber D, the air must bubble through the mercury and pass through the upper part of the chamber and then on through *F* to the tank *G*, where any excess air escapes from the open end of the tube.

Repeated strokes of the compressor will deliver air only in one direction. The seal chamber, acting as a check valve, closes the lower end of *C*, which prevents any air from returning. The mercury then rises in the glass *E* and stands at a figure on the scale which is proportional to the depth of the liquid contained in the tank. Readings of 0.1 in. of mercury are easily obtained and, if a vernier scale be used, readings of 0.01 in. can be made.

Sides of Drill Hole Washed to Recover Lost Diamond

By Roy H. Poston
St. Francois, Mo.

IN diamond drilling, a diamond will occasionally be pulled out of the core bit. The loss is not ascertained until the rods have been removed. Usually, difficulty is experienced in determining whether the lost diamond is lying in the bottom of the hole or in some small crack or crevice in the side. It is considered good practice to "wash down" the sides of the hole before any attempt is made to clean the bottom, this being done on the theory that the movement of the rods up and down might wedge the diamond more tightly in the side if it happened to be there. To "wash down" a hole properly, equipment similar to the assembly shown in the attached sketch is recommended, the


Standard plug or center without diamonds
Standard core barrel
Water through rods from drill pressure pump
Standard core bit without diamonds
¼" holes
Standard lug

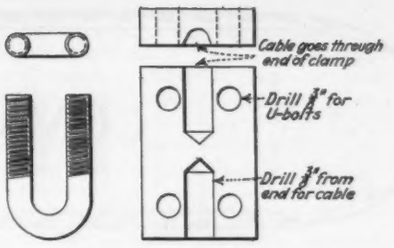
Assembly of equipment used in washing down sides of diamond-drill hole

water being supplied in the usual manner from the pressure feed pump of the drill. This operation necessitates exercise of good judgment, patience, and ability to keep cool.

This Wire Rope Clamp Grips Tightly

WIRE ROPES on mine cages, skips, and cars should be clamped to hold without slipping. This cannot always be done with one clamp. The clamp illustrated is designed in one unit, although really two clamps, according to R. M. Thomas. The advantageous feature of having one plate holding two U-bolts can easily be seen. The rope will be raised up between both bolts, which will act as a lock on both sides of each bolt.

By drilling the plate $\frac{3}{8}$ in. in diameter, and $1\frac{1}{8}$ in. deep (place two plates together to do this), leaving the center solid, the cable can be clamped into these drilled slots and raised up $\frac{1}{4}$ in. in the center. This will prevent it from



Rope clamp consisting of plate and two U-bolts

slipping. This clamp is designed for $\frac{3}{8}$-in. cable, but can be made in all sizes. It should be made of good steel. Lock washers should be used on the nuts.

Taking Readings on Exceedingly Low Rock Dips

IN REGIONS of nearly horizontal bedded rocks it is practically impossible to make accurate dip readings with a Brunton compass where the dip is less than 50 ft. per mile, states E. A. Filmer, in *Science*. It is, however, often essential in deciphering low structures to get dependable results quickly in the field. The procedure now to be described was found to meet this requirement very satisfactorily:

Tie a long nail on one end of 100 ft. of fishline. Drive this nail into the bed of rock of which the dip is to be read. Stretch the fishline across the rock face. Usually a 50-ft. exposure or a 25-ft. exposure can be had. Such lengths facilitate calculation. Mark the fishline at 25-, 50-, and 75-ft. intervals by tying on pieces of red yarn or silk thread. Have a small line-level such as is commonly used by carpenters placed over the center of the line and raise the line until the bubble reads level. Then with a carpenter's 6-ft. folding rule, note the dip, and make the calculation.

Differentiating Between Carbon and Silica in Mine Air Surveys

IN CONNECTION with konimeter practice, one of the great stumbling blocks has been the presence of small particles of carbon in mine air. This observation was made by President A. W. Rogers at the annual meeting of the Transvaal Chamber of Mines on March 25, who stated that these particles were caught with the dangerous silica dust on the konimeter slide, and it was impossible to differentiate between the two dusts under the microscope. Research work in this connection has been continued for many years, he disclosed, and a new method of eliminating carbon had been devised. In this method, slides of specially manufactured glass are ignited in a gas muffle, by which means the carbon particles are burned away and the silica residue can be estimated with accuracy.

COMMENT AND CRITICISM

Development of Montana Mineral Resources Not Neglected

Bureau of Mines and Geology, With Adequate Financing, to Function as State Geological Survey

To the Editor of "E.&M.J.":

In your issue of March 30 is a communication entitled "Montana Still Lacks a Geological Survey," by L. S. Ropes. Your correspondent's statement that the state is "without a source of reference on the mineral resources other than the meager information available in the Department of Agriculture. . . and without an appropriation for co-operation with the U. S. Geological Survey," seems utterly incomprehensible in view of the following facts, which must be as well known to him as to the writers of this letter:

In 1919 the Montana Legislature created the Montana Bureau of Mines and Metallurgy as a branch of the State School of Mines, and provided a fund of $10,000 a year for its support. The 1921 Montana Code states that the objects and duties of the bureau are ". . .To study the geological formations of the state with special reference to their economic mineral resources both metallic and non-metallic. . .To prepare and publish bulletins and reports with necessary illustrations and maps which shall embrace. . .the natural resources and geology. . .of the state."

The law also specifies that the Montana State Bureau is authorized to enter into co-operative agreement with the U. S. Geological Survey and the U. S. Bureau of Mines. In fulfillment of the mandate thus given by the 1919 Legislature, the new bureau, under the able leadership of Dr. C. H. Clapp, proceeded to function in all respects as a state geological survey, and to establish co-operative relations with the U. S. Geological Survey and the U. S. Bureau of Mines.

Publications were issued as follows:

Bulletin No. 1: "The Montana State Bureau of Mines and Metallurgy." (An explanation of its purpose and operation.) 1919.

Bulletin No. 2: "Directory of Montana Metal and Coal Mines." 1919.

Bulletin No. 3: "Mechanical Ore Sampling in Montana." (By H. B. Pulsifer) 1920.

Bulletin No. 4: "Geology and Oil and Gas Prospects of Central and Eastern Montana." (With geologic map, now out of print.) By C. H. Clapp, Arthur Bevan, G. S. Lambert. 1921.

Bulletin No. 5: "The Location, Representation, and Patenting of Mineral Lands in Montana." (Out of print.) By A. E. Adami. 1923.

The geologic map accompanying Bulletin 4 was printed in colors by Hoen, of Baltimore, on a scale of 1/500,000, and was probably the major accomplishment of that era and a most worthy one for a new organization, giving as it does a clear and authoritative picture of the areal geology of two-thirds of the State of Montana, an area of over 97,000 square miles. In 1920, Dr. Clapp left the School of Mines and the appropriation was not renewed by the 1921 Legislature. With funds derived from the Land Grant income of the School of Mines, however, the areal geology of the western one-third of the state was surveyed and mapped, but not published, because of lack of funds. Copies of both of these maps have been furnished to and used by the U. S. Geological Survey in its Montana work, and are being employed by the Survey at the present time in the compilation of a new geologic map of the United States.

Upon assuming the presidency of the Montana School of Mines in July, one of Dr. Thomson's first official acts was to approve the proposal of Dr. Eugene S. Perry that he be authorized to complete at once a general study of the Kevin-Sunburst and adjacent oil fields of the Sweetgrass Arch, which had been begun during the previous field season. This study was completed and published in mimeograph form, as Memoir No. 1, in January of the current year, during the present session of the Legislature.

In the meanwhile, President Thomson found unanimous support among the responsible mining and oil men of the state for a renewal of the special appropriation for the support of the State Bureau. To this unanimity of support there was one exception, your correspondent, Mr. Ropes, who proposed the establishment of a wholly new organization at Helena. For such a proposal he was able to secure practically no support. Following an endorsement by the Montana Section of the Institute, the Mining Committee of the Helena Commercial Club took the lead in urging the resuscitation of the already existing survey. Owing to a peculiar revenue situation, the 1929 Montana Legislature found itself most limited in its funds, but it did two significant things, so far as the mineral industry of the state is concerned. First, it changed the name of the survey to "Bureau of Mines and Geology," in order to bring name and function more closely into agreement. Second, it provided an appropriation of $5,000 a year for the renewal of this important work. Of course, $5,000 is entirely inadequate, but the appropriation does re-establish once more the principle at stake, and with certain other sources of income it will enable the Montana Bureau of Mines and Geology to make a new start at the old stand in spite of an isolated effort to defeat this manifestly desirable result.

L. V. BENDER, President,
Montana Society of Engineers.

F. A. LINFORTH, Chairman
Montana Section, A. I. M. E.

J. D. MACKENZIE, Chairman,
Mining Committee, Helena
Commercial Club.

The Tariff on Manganese Ore

To the Editor of "E.&M.J.":

The American Manganese Producers' Association has called my attention to the editorial on p. 666 of *Engineering and Mining Journal* in reference to my letter in the same issue.

Your editorial calls my letter an "illogical attack" and starts with accusing me of partisan attitude and of espousing my employer's side. I am not going to answer this part of your editorial by questioning your motives in taking the side of American Manganese Producers, although I have full right to expect from you a strictly unpartisan attitude, as for a long time *Engineering and Mining Journal* has been recognized by the mining fraternity as a public servant and exponent of truth and unbiased opinion on problems of mining and metallurgy. Would it not be better for you in this case to admit that I was guided by higher motives and thought of the well-being of our Commonwealth, from the point of view of broad statesmanship? Do you not expect to see this attitude assumed by those of your read-

ers who are connected with the iron and steel industry?

The rest of your editorial gives a good example of what Frenchmen call *"qui s'excuse, s'accuse."* Your explanations, consisting of excuses for the manganese ore industry, not only do not add anything to the laurels of domestic manganese ore mining, but actually confirm what is well known and what was said by me. The weak and insignificant position of manganese ore mining at the present time, just as it was six years ago, was very well emphasized by you.

I hope you will accept my invitation to bring this debate to the high plane of real statesmanship and use facts and figures with precision and accuracy peculiar to engineers. That will necessitate avoiding such expressions as "large tonnages," "the manganese ore industry is ready to do business," "varying degrees of importance," and so on, which you use in your editorial.

The fact is that after a six years' existence of the highest protective tariff on manganese ore ever imposed, no appreciable quantity of ferromanganese was manufactured from the ore mined in the United States. The fact is also that the "large tonnage," as you say, of manganese carbonate ore shipped from Montana mines represents only a few tens of thousands of tons. On page 160 of a report for 1927, on "Manganese and Manganiferous Ores," published by the U. S. Bureau of Mines, it is shown that Montana shipped during that year only 10,124 tons of metallurgical ore containing 35 per cent or more of manganese. A total of 16,382 tons of chemical ore was also shipped by Montana in 1927. Total ore containing 35 per cent or more of manganese, to the amount of 44,741 tons, was during the same period shipped from all the states of the Union.

These figures may look large in your editorial and possibly to the domestic manganese ore producers, but they appear infinitesimally small to the iron and steel industry, which uses approximately 700,000 tons of high-grade (50 per cent manganese) ore annually.

You say further, "Mr. Foss's statement that the manganese ore industry in the United States is limited to the production of low-grade ferruginous manganese ore is seen to be misleading."

In view of the Bureau of Mines' report above mentioned, where the following figures appear—

"Shipments of domestic ore containing 35 per cent and more of manganese, 44,741 G. T.

"Shipments of domestic ore containing from 10 to 35 per cent of manganese, 148,291 G. T.

"Shipments of domestic ore containing from 5 to 10 per cent of manganese, 1,310,127 G. T."—

I am sure every unprejudiced man will say that the manganese ore mining industry in the United States *is* limited to the production of low-grade ore. Assertion to the contrary is ostensibly misleading.

Again, the fact is that at the present time—notwithstanding an enormous protection—the domestic manganese ore industry contributes only 5 per cent to the total of the United States consumption.

It is also clear, and you have not shown anything to the contrary, that up to the present time there is no evidence that the domestic manganese ore industry is able, or will be able in the near future, to supply the actual demand of the steel industry for this ore. It is quite logical, therefore, for the steel industry to base its conclusion on these facts and to be of the opinion that the United States production of ferromanganese will be dependent upon the imported ore and that the United States should be provided with a stockpile of manganese ore for war emergency. This opinion was expressed by prominent and authoritative mining men and geologists several years ago, and still holds good. None of the circumstances upon which this opinion was based have changed. We do hear, however, different promises and read assertions such as those you make in your editorial, that "other manganese mining enterprises of varying degrees of importance and in various stages of development are already under way."

I wish to make clear, however, and I am quite confident that the whole iron and steel industry will support me in saying, that American ironmasters do not militate against the American manganese ore industry. Quite to the contrary, the steel industry is very friendly to the attempt of manganese ore miners to develop a domestic manganese ore supply. We wish them all success and luck, but *only on the basis of logical and natural conditions.* Consumers of ferromanganese will welcome the realization of your promise that domestic ore producers will go into the business of making ferromanganese. It will create internal competition and show the usability of domestic ore, as we do not believe that our ferromanganese manufacturers decline to deal with domestic ore producers for any other reeason than that this ore is unsuitable for their requirements.

By virtue of your wide experience you know very well that the mining and metallurgical industry does not approve of getting around Nature. It is hard to fight Nature with substitutes, and our problem as mining and metallurgical engineers is to use to the advantage of humanity all the available resources of the world and not to insist on the creation of a commodity in cases where Nature yields better and cheaper products for the same purpose. There are many examples I might cite, and to elucidate my idea I would say, for instance, that in Germany aluminum is not made out of domestic clays, because more adaptable material in the form of bauxite, imported from France, Italy, and other countries, can be used more profitably. We do not use quartzites and other low-grade iron ores which exist in abundance in many places in this country, because our use of such material would be more expensive than the smelting of Mesabi ore brought from 1,000 miles away. When such enterprises, in defiance of Nature's laws, start, we, with Dante, may say to them as well as to the makers of ferromanganese out of low-grade domestic ores: *"Lasciate ogni speranza, voi ch'entrate."*

I am positive that I am far from theorizing, as you accuse me, because I stand on more solid ground than you. It is clear also that logic is on my side. In your editorial you did not give facts, but merely express hope for the domestic manganese ore industry. Long ago Benjamin Franklin said, "He that lives on hopes will die fasting."

FEODORE F. FOSS.

Wheeling, W. Va.

[Putting their faith in the continuance of tariff protection, a group that is steadily increasing in size is endeavoring to establish a domestic manganese industry in the United States. To this end they are risking capital in a venture beset with many hazards, as all new ventures are. Success will mean not only the return to them of their investment plus a profit, but also the freeing of the steel industry from dependence on foreign sources of manganese—a dependence that constitutes a national weakness in times of peace and a danger in the event of war.

Mr. Foss intimates that the steel industry evidences broad statesmanship when it urges reliance on foreign resources, plus the makeshift of a manganese stockpile. If this be statesmanship, it is the kind that has sometimes led nations to their decline. The efforts of the domestic manganese producers are constructive. The best that can be said of the type of statesman suggested by Mr. Foss's words is that he stands among those who say of any daring project, "It can't be done."

Difficulties have beset the domestic manganese producers and still confront them. Instead of high-grade manganese ores they have low-grade ores; but a huge reserve, distributed in many states, particularly Minnesota, Montana, and Arkansas. No serious and sustained effort to use this reserve has before been made, aside from the mining of the low-grade Lake Superior ores. But the manganese content is large—sufficient to meet the steel industry's requirements for many years to come, at the current rate of consumption.

Mr. Foss is invited to read the numerous editorials and other articles, on the subject of domestic manganese and the tariff, that have appeared in these pages in the last two years. Thus he will realize that the contention of *Engineering and Mining Journal* has always been that a domestic manganese industry can be built in the United States only on low-grade ores; and that, to do this, time and money and re-

search and tariff protection are necessary.

Not the least of the manganese producers' difficulties is the fact that the steel manufacturers apparently do not care whether or not they are independent of foreign sources of ore supply. The matter of war preparedness, in which the recent controversy over the manganese tariff had its origin, apparently has interested them but little. Among the prospective customers of the manganese producers, the most important are the manufacturers of ferromanganese, embracing a small group that has thus the power to keep domestic manganese production within narrow limits, if they refuse to buy. So long as those of its members who are interested directly or indirectly in foreign manganese see a chance of having the tariff removed, they probably will continue to refuse to purchase the domestic ores. When they see, however, that the tariff has come to stay, they will change their attitude toward the beneficiated domestic product. The increase of ½c. per pound in the tariff asked by the domestic producers, if secured from Congress, will exercise strong influence in bringing this about.

Mr. Foss quotes figures of production from Bureau of Mines reports and asks that figures be given him in return, "with precision and accuracy peculiar to engineers." His figures show that since the Tariff Act of 1922 was passed the production of manganese ore has not reached a large amount—a fact never denied. But a single mine and plant, to say nothing of an industry, is rarely brought into production within a year or two. And the domestic manganese mines have not enjoyed the best conditions. Instead of help and encouragement from prospective customers, they have had the continual threat that the tariff was to be removed. The statement that "the steel industry is very friendly to the attempt of manganese ore miners to develop a domestic manganese ore supply" will interest the miners; they have not been aware of this interest.

To all this Mr. Foss will again quote "Who excuses himself, accuses himself," which is not necessarily true. That the domestic manganese industry has not yet become firmly established on a good production basis does not mean that it will not or cannot, and for Mr. Foss to attempt to argue otherwise is to show that he is departing from the precise engineering reasoning he advocates.

Mr. Foss says that he stands on more solid ground than that taken by this publication. But if the steel producers had had as much experience with research as the non-ferrous mining and metallurgical industries have had, they would be more optimistic as to the possibilities of utilizing the low-grade manganese reserves in the United States.

Research, indeed, might be defined as man's effort to "get around Nature," against which Mr. Foss declaims. Nature prescribed, apparently, that sulphide ore particles should sink in water, but flotation engineers have devised a way of making them rise against the pull of gravity. And certainly the Frasch process of extracting sulphur from the ground must seem unnatural to Mr. Foss. Research such as that which led to these achievements is being applied by the metallurgist and the chemist to the problem of extracting manganese from its low-grade ores and using it in making steel—work that will be continued in the face of discouragement, provided tariff protection be afforded to make the product salable.

In his concluding paragraph Mr. Foss says that facts were not given in *Engineering and Mining Journal*'s editorial of April 27, forgetful that he either suppressed the well-known facts as to existing domestic manganese mining enterprises or else betrayed an unfamiliarity with them. In addition to expressing hope for domestic manganese, *Engineering and Mining Journal* confesses to exhibiting a partisan regard for the mining industries in which it finds its field. —EDITOR.]

Safety-First Precautions

To the Editor of "E.&M.J.":

In the issue of May 11, Mr. Arthur La Motte takes exception to two points I made in my paper published in the issue of April 27.

In his first point he says: "We consider it dangerous to use even brass or copper in opening dynamite cases, especially where a leakage of nitroglycerin has occurred and where the brass or copper is likely to come in contact with the nails."

If I noticed a leakage of nitroglycerin or crystallization of any kind coming from aged powder, I would be afraid to even handle it, let alone use a wooden wedge or mallet to open the case. I am not in favor at any time of using metal implements in fixing primers or opening cases of dynamite. But custom has made it a factor that most of the old miners cannot seem to avoid. In 1886, in Aspen, one of the old-time prospectors was using No. 2 Hercules in loading his round of holes. He used his pocket knife to slit the powder, so as to get as much of the same near the bottom of the drill hole as possible. But while he was slitting one of the cartridges with the knife, it exploded, blowing off both his hands. Since we know that it is not safe to use a pocket knife for slitting powder, it should not be safe to use a steel cap crimper, or any other kind of metal.

The mining laws of California, one of the oldest mining states in the Union, allow a copper or bronze instrument to be used in opening packages of dynamite.

In the next point Mr. La Motte says: "We do not consider it unsafe to use a metal punch for priming a stick of dynamite," because, as he says, "nearly all of the modern cap crimpers made of steel are equipped with one leg pointed and curved, especially for this purpose."

If I were in his place I would dislike very much to encourage the use of his cap crimpers thus, since it is so easy to procure a piece of wood that will answer the purpose, with every safety possible.

I appreciate very much the criticism offered by Mr. La Motte, as I feel that fair criticism does not hurt anyone.

M. J. MCCARTHY.

Canon City, Colo.

Aluminum vs. Magnesium

To the Editor of "E.&M.J.":

Under the caption "Magnesium Alloys Present Opportunity for Expansion" in the issue of March 16, 1929, attention is called to the disparity in consumption between magnesium alloys on the Continent and in the United States. It is pointed out that the European production and consumption of metallic magnesium is probably 5,000,000 lb. annually, whereas the consumption in the United States was but 366,400 lb. in 1927, and probably only 13 per cent greater in 1928.

These figures do not tell the whole story. The facts are much worse. Of the 366,400 lb. domestically consumed in 1927 and 865,662 lb. actually sold in 1928, less than 15 per cent was marketed as fabricated shapes or alloys. The balance was used as a deoxidizer or desulphurizer in other metals and as a minor addition in aluminum heat-treated alloys. No corresponding figures are available for the European consumption, but it is likely that more than 90 per cent is represented by fabricated metal.

And yet the final statement of this editorial is far from the fact. It says, "Surely here is opportunity for profit which is utilized to a negligible extent." How would the editorial writer feel if he had spent ten years' time and better than $3,000,000 of corporation money in the effort to "stimulate" the use of magnesium, which he states might "easily" be done. That is substantially what two large corporations have spent in both technical and commercial research, with the insignificant return indicated.

Naturally, the question is what is wrong with magnesium in the United States, or with the corporations interested? As to the corporations, at any time in the last five years, their production could have been increased tenfold in six months. And nothing much is wrong with magnesium *per se*. The trouble lies in the competition of other materials and the fact that potential users in this country must be shown a justifiable expenditure where an increase of cost is required.

A few of the statements made in the editorial may be critically examined as the easiest way to an understanding of the facts. "Volume for volume they (magnesium alloys) are as strong as aluminum alloys and considerably lighter." The best heat-treated aluminum alloys in sheet or forgings will have 60,000 to 63,000 lb. tensile

strength with 18-25 per cent elongation. The best average result possible with magnesium base alloys is about 42,000 tensile with 10 per cent elongation. The difference in weight is as 1.74 to 2.70, or a saving of about 33 1/3 per cent. This saving in weight for equal sections is practically balanced by the difference in strength. How then can there be a saving in wrought metal of "as high as 20 per cent of the dead load of the entire vehicle." The European figures on mechanical properties for magnesium base alloys are not sufficiently different to change the result materially.

With castings the comparison is slightly better. Heat-treated magnesium castings are about on a parity as to strength and elongation with the average heat-treated aluminum castings. Eliminating the lower proportional limit due to the different moduli of elasticity, a field for magnesium castings exists, in aircraft motors and accessories where weight saving is so essential. This field has been vigorously tilled, with the trebling of consumption in a year, but this means a rate of only fifteen to twenty tons annually.

Commercial, and not technical, conditions are the limiting factor. The editorial says, "Wherever magnesium alloys can be substituted to advantage for pure aluminum, the spirit of progress and evolution demand that it should be done." Eliminating the word pure, since pure aluminum is obviously not a structural material, unfortunately the spirit of progress is a bit impeded by the costs essential to the production of magnesium base alloys in marketable form. Losses in melting are greater than with aluminum, and in subsequent fabricating operations cold work hardens magnesium much more rapidly, making more frequent annealing necessary. The lightness of the metal requires more and larger gates and risers in casting, which again is translated into additional costs.

Still more important are the different conditions abroad. With automotive vehicles, taxes and high cost of gas and oil put a premium on lightness. In Germany, magnesium-alloy wheels have been extensively used on trucks. The castings sell in quantity at 80c. per pound. Corresponding aluminum castings sell for 35 to 40c. per pound. Allowing for the difference in weight of one-third, magnesium castings are purchased at substantially a premium of 25c. per pound. In the United States does "evolution demand" that our truck manufacturers pay such an increase? It would be satisfactory to the magnesium industry if it did, but the attempt to sell the product on this basis would be disappointing.

In France, forged or hot-pressed pistons of pure magnesium have been largely sold for government aircraft motor development at a considerably higher price than the corresponding aluminum. With the highly developed aluminum piston art in this country, it has been difficult to show any advantage with the lighter metal, because of the greater expansion, smaller heat conductivity, and inferior hardness. One manufacturer has spent a fair fraction of a million dollars in the attempt to market magnesium pistons in the automotive field, without tangible return.

With these facts is it so obvious that "The tardiness of the domestic producers in rising to the occasion offers a puzzle the solution of which is not easily discernible"? The truth is that magnesium will ultimately find its place in the broad economic picture, but only through further patient and expensive research and development. Its natural market will lie in lines where peculiar properties will demand its use and not in directions where forced growth is essential and where some other broadly competitive material is commercially indicated. Unwise attempts to "stimulate" its consumption are bound to result in ultimate failure. It has taken 30 years of gradual progress to develop aluminum to a point where railroad car bodies are in sight, and yet 30 years ago enthusiasts were seeing the immediate use of the then soft and relatively weak metal in the replacement of steel. Aluminum has only a third of the weight of any of the common metals. Magnesium is two-thirds the weight of its natural competitor in the metal group, and much more difficult to fabricate. The "infant industry" is still an infant, and it needs intelligent care and sympathetic understanding.

S. K. Colby.

President, American Magnesium Corporation.

Pittsburgh, Pa.

Consultation

Treating Ore From a Lead-Zinc Prospect

"We have a mine with about 2,500 tons of ore in sight, containing zinc and lead, with some silver. Development consists of an inclined shaft about 90 ft. deep, and a tunnel about 120 ft. long along the vein at the 60-ft. level. The vein dips 45 deg., but at the 90-ft. level there is a fault or else the vein goes down vertically; we will know definitely when a tunnel that is being driven from one side at the 210-ft. level, now 640 ft. long, reaches the vein or goes through the fault.

"The average analysis of the vein is 16 per cent lead, 20 per cent zinc, and 4 oz. silver, taken at 25 different points. The zinc is in the form of oxides, carbonates, and silicates; the lead in the form of carbonates and galena; and the silver probably in the form of sulphide. The vein is rather near the contact of metamorphic limestone with basalt, the ore deposits lying in the limestone.

"Will you kindly tell us if the metal can be separated profitably by hydrometallurgical methods; the approximate price of the smallest plant that can be operated economically; and where to get it. If that method is not fit, kindly tell us the best way to work the mine. The mine and adjacent country are dry, and water is 12 miles away. Salt would cost 14c. at the mine."

No thought should be given to the erection of a treatment plant until considerably more development work has been done, for 2,500 tons of ore would shame even a stock promoter as a basis for building a reduction plant. The ore, when developed, will probably offer no insurmountable difficulties in treatment, but if fears are felt on this score, a representative sample may be submitted to a testing laboratory for a preliminary report. It seems probable that the ore is oxidized only at the surface, and that, as you go deeper, sulphides will be encountered that will make the ore amenable to the usual selective flotation treatment. Small 50-ton flotation plants can be obtained for around $25,000, but will probably cost nearer $50,000 delivered at your mine and ready for operation. Even a 25-ton-per-day plant is available. For names of manufacturers and engineers, consult the advertising pages of this issue.

If the ore is oxidized at depth, you have more of a problem on your hands, as the practice is less standardized. Valuable lessons can be drawn from the experience of the Chief Consolidated and Tintic Standard companies, in Utah; from that of Phelps Dodge at Warren, Ariz.; and from that of the Cerro de Pasco company in Peru. A consulting engineer should be employed.

Outlook of Manganese Industry in South Africa

"Can you tell me if the manganese discoveries in South Africa have reached a producing basis as yet, what companies are interested, and what the probabilities are for the future?"

The manganese deposits at Postmasburg, South Africa, to which you undoubtedly refer, have not as yet reached the producing stage. A new company, the Manganese Corporation of South Africa, Ltd., capitalized at £1,000,000, and with head offices at Johannesburg, has been formed to develop the orebodies, control of which it has acquired from the Union Manganese Company.

No definite announcement has been made as to when extraction operations will begin, but early construction of the 66-mile railroad from Koopmansfontein to Postmasburg, which is essential to the project, seems assured. Under the plans formulated by the Manganese Corporation and the agencies financing the construction of the railroad, the corporation guarantees a minimum total shipment of 200,000 tons of ore the first year and 350,000 per year thereafter.

INDUSTRIAL PROGRESS

The Equipment Review

Novelties Recently Introduced Include an Interesting Water-Level Indicator for the Boiler Room, a Motor Developed to Give Ultra-Quiet Performance, and Some New Valves

A SIMPLE DEVICE which permits the placing of water-level indicators at any desirable location or elevation has been recently put on the market by Combustion Engineering Corporation, New York. Fig. 1 shows how this water-level indicator operates and why it is possible to situate it at any convenient location. The usual water column is shown connected to the boiler drum. Inside the water column is a non-corrosive float suitable for the maximum working pressure for which the boiler is designed. This float is direct-connected by means of a non-corrosive wire extending downward through a small pipe to an indicator in the water glass. The circuit around this indicator is filled with cold water, which has no corrosive effect on the glass.

The indicator is so adjusted that when the float in the water column on the drum is in its normal position the indicator within the lower glass is also in the center of the glass, its normal level condition. Consequently the indicator fluctuates correspondingly with the up and down movement of the water-column float at the drum. The indicator may be located to meet any conditions. If the indicator cannot be dropped vertically from the water column on the drum, arrangements are easily made whereby the water column can be placed inside the drum, or, as shown in Fig. 2, horizontal extensions of any length can be made to bring the water column to any desired position. To prevent leakage in case the water glass should be broken, an automatic shut-off valve is placed in the circuit directly above the glass. This conical valve is attached to the wire between the water column and the water-level indicator in such a position, as shown in Fig. 3, that when the glass is broken, and the water released, the valve is forced into the valve seat, thus closing the cold-water circuit.

After a new glass has been put in place, valve *A*, Fig. 1, is open, valve *B* remaining closed, thus equalizing the pressure above and below the valve. The float then returns to the position of the water level, and in so doing lifts the valve *CV*, which allows the water to again fill the indicator gage glass.

The device is especially desirable because of its convenience and also because, operating in a cold-water circuit, it eliminates the continual replacing of glasses on ordinary water columns, which are eaten away and broken so easily by the corrosive action of the hot water. By having in contact with the glass, cold water only, the usual round glass is suitable for exceedingly high pressures.

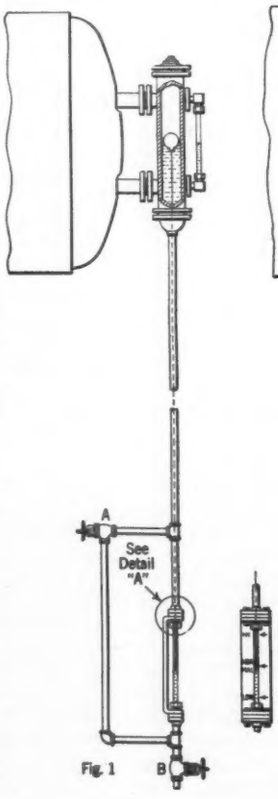


Fig. 1

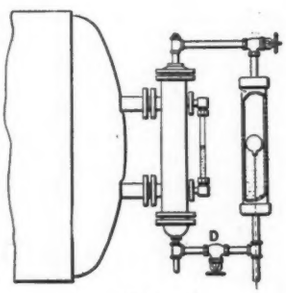


Fig. 2

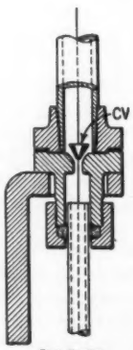


Fig. 3

The new indicator can be installed in conjunction with, or separate from, the regular high- and low-alarm signal system.

Electrical Valves for Remote Control

A packless type of solenoid valve for the remote control of oil, gas, water, and air has been developed by the Electric Valve Manufacturing Company, 68 Murray St., New York. It is actuated by a push button or automaticaliy by means of a two-wire thermostat, a pressure regulator, or float switch. Its special feature is that stuffing box and packing are eliminated, thus doing away with leaks caused by faulty packing and with the common tendency to stick, as well as with the necessity of repacking from time to time. Little maintenance is required.

General Electric has likewise announced its so-called CR9505-A1 and -B1 solenoid-operated valves for remote control of liquids and gases under pressure. These are intended for ¼- and ½-in. pipe connections, and for a pressure of 80 lb., a maximum voltage of 550 a.c. or d.c., and a maximum temperature of 212 deg. F. They are designed to meet the demand for small, leakless, reliable, and inexpensive valves for electrically controlling the flow of liquids or gases from a remote point. They are of the unbalanced type, being normally either open or closed, and are supported directly by the pipe line in which they are connected.

In this valve no stuffing gland or packing is used and no adjustments are necessary. Leakage between pressure chamber and atmosphere is impossible, inasmuch as a bellows transmits the motion of the solenoid armature to the valve stem. The valve seat is made easily accessible to facilitate grinding. Valve body and stem are of rolled brass. The seat of the ¼-in. valve is of rolled brass, and that of the ½-in. valve of monel metal. All external parts are cadmium-plated.

A New Gasoline Geared Locomotive

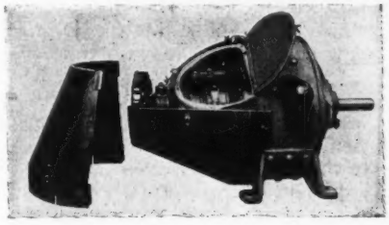
A series of gasoline-operated, gear-driven industrial locomotives of an improved tyne has been announced by the Cincinnati Car Corporation, Cincinnati, Ohio. In designing them, simplicity, durability, and better performance have been objectives. The line is known as the 1200 Series.

The locomotives have four good starting and traveling speeds, forward and reverse. A large ratio of engine horsepower per ton of locomotive is provided in the heavy, strongly built, slow-speed engine used, so that a liberal drawbar pull is available in each speed, permit-

ting the load to be hauled at a good rate. Other features include an oil purifier, a gasoline strainer, and a temperature gage; provision of a large water capacity in an oversize radiator to permit proper cooling in hot weather or hot climates; a clutch combining the advantages of both the dry and oil clutches, without their disadvantages; a strong and heavy one-piece steel frame; and location of the drive wheels inside the main frame, so that the axle bearings are on the ends of the axles instead of behind the wheels, thus affording convenience in lubrication and inspection.

Two New Motors

A new motor developed for use where quiet performance is desirable has been introduced by the Wagner Electric Corporation, St. Louis. It is completely insulated from the supporting cradle-shaped base by rubber bushings, this giving practically noiseless operation. Despite the use of rubber, the unit is



A totally inclosed fan-cooled d.c. motor for dusty sections of the plant

practically rigid and the shaft alignment is assured.

Westinghouse has recently announced a new totally inclosed fan-cooled motor (Type SK). To provide simplicity and interchangeability of parts, its standard Type SK construction and parts were used as far as possible. Excepting the shaft, all mechanical parts are interchangeable with those used on the totally inclosed motor of the same frame size hitherto carried by the company. The essential mounting dimensions are also the same as those of the standard open type of the same frame size. Sealed sleeve bearings, protecting the motor against dust and fumes, are used. The commutator end is also inclosed with a sheet-steel cover, which has a perforated protective end through which the fan draws the cooling air. The air is directed over the bracket and passes out over the top of the motor, covering approximately three-quarters of the surface. The motor is intended for use wherever the air contains much foreign matter which may injure the motor windings.

A Three-in-One Switch

A new switch which combines in one box a motor circuit switch, provision for line fuses, and a magnetic starting switch has just been introduced by General Electric. It is known as the CR-7006-F-1 switch, and is intended to take the place of the three devices usually required in controlling the operation of a motor. The box requires no more wall space than does the magnetic switch alone, and is said to cost no more than the three parts separately. In addition, instant replacement is possible in plants having several magnetic switches of one kind, in case any switch is disabled. The switch can be opened without tools in an emergency. Thus disabled switches can be repaired when convenient and with safety to the repair man. The motor circuit switch will actually handle the stalled motor current and, in emergency, can be opened safely.

Bottom Pouring Features New Melting Pot

Wherever large quantities of bearing metals are to be handled, a metal melting pot having a bottom-pouring spout will be found convenient. Such a pot has recently been introduced by General Electric. It is known as the Type RP, Form F. The bottom pouring feature is particularly applicable where ladling is impracticable and where large quantities of metal are handled. This pot is designed for melting lead, babbitt, tin, solder, type metal, and similar alloys or metals, except zinc, at temperatures not exceeding 950 deg. F. An automatic control panel and a temperature control instrument are provided. In the pot the heat is generated directly in the metal, affording quick heating and low radiation loss. Heating units can be replaced without interrupting production. The maximum rate of heating is obtained without overheating.

BULLETINS

ELECTRIC DISTRIBUTOR—Bulletin No. GEA-1067, line material. Fifty-eight pages.

CARS—Eastern Car & Construction Company, Easton, Pa. Booklet entitled "Quarry Car Practice." Thirty-two pages.

MOTORS—Wagner Electric Corporation, Shell Building., St. Louis, Mo. Bulletin No. 163, rubber-mounted motors. Four pages.

MOTORS—General Electric Company, Schenectady, N. Y. Bulletin GEA-98-A, adjustable varying speed motors type BSR. Two pages.

ELECTRICAL EQUIPMENT — Ohio Brass Company, Mining Division, Mansfield, Ohio. Bulletin describing pre-convention display of new O-B devices. Four pages.

QUICKSILVER FURNACES—H. W. Gould & Company, Mills Building, San Francisco, Cal. Descriptive bulletin of Gould rotary furnaces and condenser system. Twelve pages.

WELDING—Oxweld Acetylene Company, Carbide and Carbon Building, 30 East 42d St., New York City. Booklet entitled "High Test Welding Rod." Twelve pages.

MOTORS—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Leaflet 20403, describes the Class 11*210 reversing line starters for squirrel-cage induction motors.

TRANSFORMER PERFORMANCE — Wagner Electric Corporation, St. Louis, Mo. Bulletin 164, a discussion of the losses which occur in distribution and power transformers. Twelve pages,

INDUSTRIAL NOTES

The Dorr Company, Inc., announces that its British associated company, The Dorr Company, Ltd., moved to Alford House, Wilton Road (Victoria), London, S. W. 1, recently.

The Fairfield Engineering Company has opened an office in the Transportation Building, 609 South Dearborn St., Chicago, Ill. W. C. Meadows, Chicago sales representative, will make his headquarters in this office.

At a special meeting of the board of directors of E. F. Houghton & Company, Philadelphia, Louis E. Murphy was elected president to succeed the late Charles E. Carpenter.

Neil Currie, Jr., has been named manager of the Philadelphia works of the General Electric Company. Robert V. Good, section superintendent, in the Schenectady works, has been named assistant to the manager at Philadelphia.

The line of industrial lubricating equipment bearing the Dot name has been purchased by the Alemite Manufacturing Corporation, of Chicago, which will continue its manufacture and sale. The Carr Fastener Company, of Cambridge, Mass., which formerly manufactured Dot lubricating equipment, is now concentrating on Dot fasteners.

Incorporation of the Jeffrey Manufacturing Company, Ltd., at Montreal, Que., is announced by the Jeffrey Manufacturing Company, of Columbus, Ohio. This new Canadian company has its head office and works in Montreal, a branch office in Toronto, and a mining supply warehouse in Calgary, Alberta. Officers of the Jeffrey Manufacturing Company, Ltd., are R. W. Gillispie, president; R. H. Ross, treasurer and manager; and F. N. Diehl, secretary. The complete line of Jeffrey chains, portable loaders, elevating, conveying, pulverizing, crushing, and mining equipment will be supplied by the new Canadian company.

George A. Burnham, president of Condit Electrical Manufacturing Corporation, has been appointed president of American Brown Boveri Company, Inc., of Camden, N. J., a newly formed subsidiary of the American Brown Boveri Electric Corporation, created for the purpose of placing all electrical and mechanical operations, exclusive of shipbuilding, under one management. Mr. Burnham graduated from Tufts College (B. S. in engineering, 1908; M. S., 1910). Prior to attending college he was engaged in the construction and operation of power plants. Soon after graduation he was employed by the Condit Electrical Manufacturing Company, which he has served in various capacities, being elected president in 1926. During the last nine months, in addition to his duties as president of Condit Electrical Manufacturing Corporation, he has been assistant to the president of American Brown Boveri Electric Corporation, and general manager of the Electrical-Mechanical Division, which activities are now included in American Brown Boveri Company, Inc.

Book Reviews

SUBSIDENCE AND GROUND MOVEMENT IN THE COPPER AND IRON MINES OF THE UPPER PENINSULA, MICHIGAN. *Bulletin 295, Bureau of Mines. By W. R. Crane. Pp. 66. Price 40c.*

ANY BULLETIN on this subject from the pen of Dr. Crane merits the careful consideration of the mining industry. Dr. Crane points out that it is in the iron mines of the Lake Superior district that the most extensive failure of support in stopes and hanging wall has been observed, although these phenomena are to be noted also in the copper mines of the region. For this reason his discussion of subsidence and ground movement deals more largely with the former. He says, however, that the investigations in both the copper and the iron mines have demonstrated that the factors controlling the phenomena are identical in both, thus making it necessary to consider the two kinds of deposits, with appropriate distinctions between the occurrence and workings. Dr. Crane summarizes his observations as follows:

"The failure of hanging wall, top rock, and formations inclosing orebodies is caused by mine excavations in conjunction with lines of weakness in the rocks, such as bedding planes, joints or slips, and faults. Slips have a predominating influence in controlling and directing subsidence and ground movement. Failure originates in stopes and extends to foot- and hanging-wall rocks; with slight cover cave-ins occur; with considerably greater depth extensive fracturing of overlying rock takes place with settlement, while with much greater depth settlement or subsidence results, often with only slight fracturing. The movement to and into the mining excavations is designated as draw, and follows certain well-defined lines, which vary with the locality but are remarkably regular and uniform, even in disturbed areas. Buckling contributes materially to ground movement and may alone be responsible for extended disturbances.

"With a knowledge of the controlling and directing factors in ground movement the development of properties can be planned for maximum protection of workings and surface, but protection to both workings and surface after failure begins is difficult if not futile. However, by changes in the method of attack in mining and the use of filling it is possible to reduce and in some cases to prevent serious damage.

"Lines of levels across subsided areas are of little value in the interpretation of conditions underground relative to ground movement and subsidence. Numerous instances might be cited to corroborate this statement. A careful study of the character, condition, and occurrence of ore and the associated rock formations will yield information of much importance, which, supplemented by observation of the movement of rock masses, will usually give the key to the situation.

"The following suggestions and recommendations are offered as partial or complete measures to be taken in the protection of property from subsidence and ground movement due to mining. They may be grouped under two heads, depending upon whether the mining operations are in the preliminary stages—are being planned, for instance—or have been under way for some time. In the former instance the suggested measures may be classed as precautionary, whereas in the latter they are remedial.

"*Precautionary Measures*—Mining operations, including all development work, such as shaft sinking, the driving of drifts and crosscuts, the erection of the mine plant, and the location of villages, can be safeguarded to the best advantage by making a careful study of conditions before the property is developed. It can be accomplished by determining the factors that control the failure of formations and placing the vulnerable parts of the proposed operations well outside the areas subject to damage by subsidence and ground movement. The application of such factors to specific cases covering common occurrences of ore is given in this report.

"*Remedial Measures*—By far the larger number of examples of damage to mines and adjacent property is connected with active workings and usually what may be classed as old operations. The work to be done has therefore passed largely from the precautionary to the remedial. The following remedial measures offered may wholly or in part prevent damage or its further extension: (1) Carry the working face or longer dimension of the workings parallel to or diagonal with the line of draw; (2) leave blocks of unmined ground to be removed during the last stages of mining, if possible; (3) use a filling of waste rock, particularly in connection with block mining; (4) fill caving pits with waste rock, thus increasing the support of the walls; and (5) release masses of the hanging wall and footwall by blasting or otherwise loosening the rock, which would also serve to increase support of the walls.

"When it is possible to control the direction of the working face the draw in the wall rock will be greatly reduced by presenting the shortest line of least resistance to the movement, such as when the face of the workings parallels or cuts across the draw.

"If left close enough together, blocks of unmined ground will very effectively check ground movement; but it may be impossible to reclaim entirely the ore left in blocks for such purpose.

"Waste filling is always effective in retarding the movement of wall rock into caving pits, but owing to the expense it is questionable whether it can be used to advantage; however, filling introduced into caving pits at the surface has an additional advantage over ease and economy of placing, in that its added weight makes it more effective.

"Shafts or buildings adjacent to caving pits may be protected by running waste rock into the pit and banking it against the wall at a point nearest the area needing protection. The supporting effect of the bank of waste may be sufficient to prevent collapse of the walls until the workings have attained considerable depth. Furthermore, large masses of rock detached from the walls in the workings would by their usual increase in volume hold back and often check, for certain periods, the draw of wall rock."

PETROLEUM AND COAL. *By W. T. Thom, Jr. Princeton, N. J.: Princeton University Press. Price $2.50.*

THE author of this volume, Prof. W. T. Thom, Jr., was formerly in charge of the coal and oil division of the U. S. Geological Survey and is at present a member of the Department of Geology at Princeton University. His intimate acquaintance with the technical and economic problems of the coal and oil industries would lead the reader to anticipate a comprehensive treatment of the subject, rather than the brief general discussion that he offers in this volume of slightly more than two hundred pages. Because of his anticipations the reviewer cannot refrain from an expression of regret concerning the character of the book. However, it is hardly fair to criticize Professor Thom's book on this basis when he very definitely states in his preface that it is his desire "to present this study in a way to make its significance clear to all who are interested in public matters, but lack time to delve into the rather overwhelming volumes of technical literature now published."

Chapters II to X are devoted to discussions of the origin, properties, geological occurrence, methods of production, and utilization of coal and oil, and to the extent and distribution of the reserves of these essential fuels. These chapters add but little to what has appeared in previous publications. Their value lies in offering to lay readers an accurate condensed statement of the most recent data available. In his introductory chapter the author cites numerous illustrations to prove the importance of mineral resources in the past. Although the reader is inclined to question the importance given to some points, he is glad they have been made, because of the thoughts they provoke. In the two concluding chapters the author stresses the importance of coal and oil to the civilization of today and tomorrow, and points out the necessity of a fair and equitable development of these resources for the benefit of the world as a whole.

Although the effort to popularize the subject has resulted in the loss of some scientific tone, the book is vastly more acceptable than the attempts of popular writers to present scientific subjects. The reader regrets that the printers have not devoted more care to the preparation of this book, as it is one of the first attempts on the part of a scientifically trained man to present his subject to the general reader, and deserves greater consideration. E. R. LILLEY.

AN INTRODUCTION TO CRYSTAL ANALYSIS. *By Sir William Bragg. New York: D. Van Nostrand Company. Pp. 168. Price $4.25.*

Development of X-rays as a means of studying the structure of matter is the topic, in general, of the book. The important methods of crystal analysis are covered and all stages of such analysis developed. A final chapter is devoted to an investigation of the structure of metals and alloys by X-ray methods.

Personal Notes

R. E. Dwyer, vice-president of Anaconda Copper Mining, was recently in Miami, Okla.

H. C. Wilmot is at Kingman, Ariz., where he expects to remain for several weeks on a professional visit.

J. V. N. Dorr sailed for Europe on May 24 from New York. Mr. Dorr is expected to be away for about three months.

Alex Wise, manager of Flowery Mines, at Virginia City, Nev., was recently injured in a fall from a ladder at the Lady Bryan mine.

E. Simon, president of the Ore & Chemical Corporation, sailed recently for Europe. He expects to return to this country in September.

C. W. Newton, director and general manager of Callahan Zinc-Lead, has returned to Wallace, Idaho, from New York, where he attended a directors' meeting of the company.

Carlton D. Hulin, of the University of California, is studying the geology of the Sunnyside mine and adjacent properties in Southwestern Colorado, for U. S. Smelting, Refining & Mining.

A. G. Langley, government mining engineer for the southeast district of British Columbia, has resigned and will leave the service to enter private practice as consulting engineer at Vancouver.

Ray J. Farmer, formerly chief mine engineer for the Morenci branch of Phelps Dodge, at Morenci, Ariz., is now an associate in the firm of Hoggan & Farmer, general contractors of Phoenix, Arizona.

E. P. Mathewson, professor of administration of mineral industries, at the University of Arizona, was recently made a "member with distinction" in Tau Beta Pi, honorary engineering fraternity.

Charles A. Mitke, who is now in London, expects to start for Australia, where he will supervise mining methods at Mount Isa, some time in June. He will pass through New York on his way to the mine.

Clinton H. Crane, president, St. Joseph Lead Company, delivered the commencement address at the Colorado School of Mines, Golden, Colo., on which occasion he was awarded the honorary degree of Doctor of Science by the institution.

Dr. **C. A. Heiland,** professor of geophysics at the Colorado School of Mines, is now in Europe, where he will visit scientists and institutions engaged in geophysical research. He will return to Golden, Colo., about the middle of September.

Dr. **H. T. James,** government mining engineer for the northwest district of British Columbia, has resigned his position, and has accepted a place as field engineer for Granby Consolidated. Dr. **Joseph Mandy** will succeed Dr. James in the northwest district.

Frank G. Fenix, of Joplin, Mo., has been reappointed state mining inspector of Missouri by Governor Henry S. Caulfield for the term expiring May 1, 1933. Mr. Fenix was appointed early in the term of Governor Sam Baker, Mr. Caulfield's predecessor in office.

Richard V. Ageton, formerly accident prevention engineer, Tri-State Zinc and Lead Ore Producers' Association, has resumed his duties as deputy mining supervisor, U. S. Geological Survey, in

RICHARD V. AGETON

the Oklahoma zinc and lead mining district. Mr. Ageton left the government's service to organize the association's accident-prevention campaign, which effected a marked decrease in the number of accidents occurring in Tri-State mines.

Sam Tour is now associated with Lucius Pitkin, Inc., analytical and consulting chemists, 47 Fulton St., New York, as vice-president and chemical and metallurgical engineer, in charge of the consulting chemical and metallurgical service of the company.

Dr. **H. C. Boydell,** of Toronto, requests that geologists interested in his paper on "Operative Causes of Ore Deposition" and the subsequent discussion should apply for reprints to the Secretary, Institution of Mining and Metallurgy, 225 City Road, London, England.

Colonel **R. F. Massie,** of Toronto, has been elected president and general manager of the Asbestos Corporation, of Canada, succeeding the late **W. G. Ross,** who died in April. Colonel Massie has been president of the Black Lake Asbestos & Chrome Company for the last ten years.

Dr. **Joseph L. Gillson,** associate professor, department of geology, of the Massachusetts Institute of Technology, at Cambridge, has been granted a leave of absence for the year 1929-1930, and will serve as associate professor of economic geology at Northwestern University, Evanston, Ill.

Prof. **J. E. Hawley,** of the University of Wisconsin, has been appointed head of the department of mineralogy at Queens University, Kingston, Ont. He is a graduate of Queens University and succeeds Prof. **E. L. Bruce,** who takes the Miller Memorial research chair in geology at the university.

Charles T. Fisher, vice-president of General Motors, has been elected a director of Anaconda Copper. **Charles E. Mitchell,** chairman of the National City Bank, has also been elected to the Anaconda board. Messrs. Mitchell and Fisher succeed **A. Melin,** secretary of the company, who retains that position, though retiring as a director, and **George H. Church.**

F. J. Eager, former superintendent of the Levack mine, of International Nickel, in the Sudbury district, has been appointed assistant superintendent of operations at the Frood mine. **L. Sharpe,** superintendent at the Garson mine, will succeed Mr. Eager at the Levack, and will in turn be succeeded at the Garson by **W. J. Mumford,** formerly superintendent of the Worthington mine, which is no longer in operation.

F. L. Ransome, professor of economic geology at the California Institute of Technology, will sail from New York on June 19 to attend the Fifteenth International Geological Congress at Pretoria, South Africa. Dr. Ransome goes as a delegate from the National Academy of Sciences, National Research Council, Geological Society of America, A.I.M.E., and the California Institute of Technology. He expects to spend some time at the copper deposits of Northern Rhodesia, after the session of the congress.

George V. McKenzie, secretary of the Canadian Institute of Mining and Metallurgy, has been appointed managing director of Thompson-Cadillac Mines, succeeding **James Thompson,** vice-president of the company. **F. B. Burpee,** of Ottawa, and Sir **Thomas Tait,** of Montreal, have been elected to the board of directors to succeed **E. S. Gordon** and **H. Lea,** who resigned. **George Campbell** has been appointed mine manager, succeeding **Murray Kennedy,** who also resigned. The offices of the company are being moved from Toronto to Montreal.

An Appreciation of Charles W. Goodale

THE passing of Charles W. Goodale, at Boston, on April 11, ends an era in the history of engineering of our time. Mr. Goodale's remarkable ability cannot be easily forgotten, but in addition to his engineering accomplishments he was ever the soul of honor, generous to a fault and always ready to aid the young engineer. Since 1890 I had the pleasure of knowing him and his work, making his acquaintance at the time that he was associated with that prince of old-time smeltermen, Henry Williams, general manager of the Colorado Smelting Works at Butte, who passed to his reward many years ago. In the fourteen years I spent at Butte, my efforts as a struggling young engineer were greatly assisted by these two geniuses, and I should like here to voice my appreciation of their intrinsic worth, not only to the engineering profession, but to all those who were fortunate enough to make their acquaintance.

WALTER W. WISHON.

NEWS OF THE WEEK

Summary

A TEMPORARY agreement has been reached by Nevada Consolidated and Consolidated Coppermines over the mining of their adjoining claims in the Ely district of Nevada. Page 891.

* * *

Treadwell Yukon has started operations at its Tybo mill, in Nevada. This new plant has a capacity of 250 tons of silver-lead-zinc ore daily. Page 891.

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Hecla Mining will build a concentrator at the Union mine, north of Grand Forks, B. C., on which it has been doing development work for the last two years. Page 889.

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Shattuck Denn has struck some high-grade ore on the 2,200 level of its Denn mine in driving a drainage drift which will connect with Calumet & Arizona's Junction shaft. Page 890.

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Greene Cananea is increasing the capacity of its concentrator, in northern Sonora, to 3,000 tons daily. Completion of this remodeling work is expected by the end of the year. Page 890.

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Construction of two large furnaces for the treatment of lead-smelter slag has been started by Consolidated Mining & Smelting at Trial. Company's Sullivan mill is treating 5,000 tons daily. Page 889.

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Missouri Mining is building a test mill on the Jasper lease, in the Tri-State district, to determine the grade of ore accurately. Favorable results will mean joint operation of the property with Jasper Mining. Page 893.

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Financing plans recently announced will provide three Rhodesian copper companies with nearly $20,000,000 for development and equipment work. Latest results of diamond drilling work show extensions of known orebodies. Page 892.

Senator Pittman Proposes 30c. Tariff on Imports of Silver Into Country

By Paul Wooton
Special Washington Correspondent

AN AMENDMENT to the tariff bill, proposing a duty of 30c. an ounce upon the importation of all forms of silver into the United States, except United States coins, has been proposed by Senator Pittman, of Nevada. The proposed amendment expressly provides for the importation of silver in every form for processing and refining in the United States for export but not for use in the United States. Such importations of silver will be under bond, and will not be subjected to the payment of the duty provided in the amendment, as such duty applies only to silver imported for sale or use in the United States.

In a brief submitted to the Financial Committee Senator Pittman justifies the proposed amendment upon the declaration in both the Democratic and Republican platforms to the effect that a duty will be charged which will equalize the cost of production abroad and at home. He asserts, and supports his proposition with statistics, that the average wages paid to miners in the mines in the United States that produce silver is $5 a day for an eight-hour day, whereas the average wage paid to miners in Mexico, from which our chief exports of silver come, is 2.95 pesos ($1.21) per day. (A peso has a value of approximately 41c. in United States currency.) Moreover, in most of the mines in Mexico, asserts Senator Pittman, the day labor is not limited to eight hours, but the miners are employed for a period of ten hours, or longer.

Senator Pittman relies on the promises of both political parties in their platforms to equalize the benefits and the burdens of the tariff and to place the various industries upon an economic equality. He shows that the average pre-war price of silver in 1913 was 61c. an ounce, whereas the present price of silver is below 54c. an ounce. He then takes the average price of all commodities for 1913 and shows that the average increase in the market value of all such products to the present time is over 45 per cent. So he argues the cost of all products has increased over 45 per cent, though the market price for silver during such period of time has decreased over 11 per cent. He shows that the market price of farm products during such period has increased over 45 per cent.

The Senator contends that the low price of silver is not due to overproduction, and cites in support of this contention that the statistics disclose that the annual production of silver in the world has not been increasing, and at the same time the production in the United States has been decreasing. He quotes from the annual report of the Director of the Mint for the fiscal year 1928 wherein it is stated, "Silver of domestic production during 1927 totals 60,434,441 oz., valued at $34,266,328; this compares with 62,718,746 oz., valued at $39,136,497, for 1926 . . ." He asserts that there is no surplus of silver in the world other than that being accumulated to meet seasonal demands in India and China.

According to Senator Pittman's preliminary brief, the total consumption of silver in the United States for the fiscal year ended June 30, 1928, was 34,062,257 oz., and during such period there was imported into the United States free of duty a total of 103,941,485 oz., distributed as follows:

	Ounces
Mexico	69,607,578
South America	17,498,903
Canada	8,015,890
Other countries	8,819,114
Total	103,941,485

With the exception of the small amount of silver imported from Canada, it is contended by Senator Pittman that all of the silver imported was from countries having low standards of living and cheap wages approximating the wages in the silver mines of Mexico, and that this cheap foreign silver first competes with American silver in the home market and then competes with it in the world market.

Even the United States government, asserts Senator Pittman, is purchasing about half of the silver used by it in the manufacture of United States subsidiary coins from this cheap foreign imported silver. When it is known, he states, that the government is selling the dimes, quarters, and halves that it manufactures from this silver that it purchased during the fiscal year 1928 at an average of 57c. an ounce to banks

and commerce at a valuation of $1.38 an ounce, it must be realized that our government is not only not offering any protection to the silver mining industry, but in its selfish desire to make a profit on silver is participating with other instrumentalities in bearing the market price of such product.

Senator Pittman is endeavoring not only to present to the Finance Committee of the Senate the deplorable condition of the silver-mining industry, but at the same time to arouse the Senators and Representatives from the silver producing states to united action.

The only noteworthy mineral change in the tariff bill amendment reported last week by the Ways and Means Committee was a recommended duty of $4 per ton on salt cake or sodium sulphate, formerly on the free list. This rate also applies to other sulphates not otherwise specially provided for or mixtures in chief value thereof.

Dynamite is put in the chemical schedule at its former rate of 1½c. per pound and fulminates are listed at 12½c. per pound.

Ontario Government States Stand on Kamiskotia Line

THE Ontario government has replied to the contention of Hollinger Consolidated that it is holding up the building of a branch railway from Timmins to Kamiskotia, Ont. The government investigated the proposition and came to the conclusion that a deficit of approximately $60,000 a year after meeting interest charges would result. Hollinger was asked to guarantee a deficit of that amount over a period of several years, and it declined to do so. The government is now investigating the proposal to build a lighter line, electrically operated, to see if the deficit can be reduced. It is prepared to operate the line at cost, but does not believe it should be required to meet deficits.

Newbec Finds Extension of Ore at 250 Ft.

A CROSSCUT on the 250 level of the Newbec mine, at Rouyn, Que., has encountered the downward extension of high-grade ore found on the 125 level. Diamond drilling at this point showed about 12 ft. of ore, and these results have been confirmed by the crosscut. With additional work it has been determined that the orebody is of the replacement type of deposit, similar to the orebodies found at the Horne mine, of Noranda Mines. At 1,200 ft. from the shaft a considerable area of disseminated copper has been found.

Mayflower Starts Tunnel

Mayflower Mines Corporation has started driving its tunnel in Dutch Pete Hollow, one mile from Keetley, Utah, in the Park City district. Camp buildings are being erected and machinery is being installed.

C. M. & S. Building Lead-Smelter Slag Furnaces

WORK on the construction of two large furnaces for the treatment of lead-smelter slag has been started at the Tadanac smelter of Consolidated Mining & Smelting, at Trail, B. C., following the successful operation of a pilot furnace for several months. Details of the process have not been released, but it is understood that fuming of the lead and zinc content of the slag will be done in huge water-jacketed furnaces, 10x10x20 ft., and that the fumes will be collected in a baghouse. Those escaping from the baghouse will be electrically precipitated. The heating is understood to be by a mixed electrical and powdered coal process devised at the smelter. The slags, which have been accumulated for several years, are said to average 15 to 20 per cent zinc-lead, the former metal predominating.

At the Sullivan mill, the company has completed part of the additions to the plant, now operating at about 5,000 tons daily, and the work of raising the capacity to 6,000 tons is expected to be completed within a month or so. Although this figure represents a tonnage increase of 50 per cent, the mine's metal output will not be increased correspondingly, because the company intends treating lower-grade material than has hitherto been extracted. Two new vertical air compressors, made by Beilis & Morcom, an English firm, are being installed to provide for increased mine output. They have each a capacity of 3,150 cu.ft. per minute.

Hecla Will Build New Mill at Union Mine

HECLA MINING, of Wallace, Idaho, will start construction of a 125-ton concentrator at the Union mine, at Franklin, near Grand Forks, B. C., in the near future, according to a statement made by Paul S. Schultz, who has been developing the property for the last twenty months for Hecla. Some road work will have to be done to allow the hauling of heavy machinery from Lynch Creek, on the Kettle Valley Railway, to the mine, and arrangement for speeding this work has been made with the Provincial government. In the meantime Mr. Schultz is assembling lumber for a bunk house, mill, and other camp buildings. He expects to have the concentrator in operation before winter.

Hecla took an option on the Union mine in the fall of 1927 for $175,000. This will be paid out of smelter returns from concentrate shipments. It also optioned the adjoining Maple Leaf group for $10,000. It has driven four tunnels into the ore zone on the Union, which consists of a gangue of quartz and disintegrated greenstone mineralized with gold-bearing iron pyrite.

Between 1913 and 1920 Union Mining shipped to the old Granby smelter, at Grand Forks, 3,612 tons of ore, having a value of $121,676, from shallow workings. The mine was closed when the smelter was closed.

Ore on the Maple Leaf occurs in stringers and lenses of chalcopyrite in a pyroxenite-augite belt. The chalcopyrite carries both gold and platinum. Clean chalcopyrite has assayed as high as 0.38 oz. of platinum per ton. Two cars of sorted ore were shipped from Maple Leaf to the old Granby smelter, but as the platinum content was not paid for no more shipments were made.

K.L.G. and Teck-Hughes Reaching New Depths

WITHIN a few days the winze at the Kirkland Lake Gold mine will have reached a depth of 3,600 ft., the greatest depth in the Kirkland Lake camp, in Ontario. On the adjoining Teck-Hughes property, good ore was found in some levels up to the diabase dike, which is near the Kirkland Lake Gold boundary and which is gradually dipping to the west into Kirkland Lake Gold ground. On the 3,600 level this company is expected to have 150 ft. east of the dike to the Teck-Hughes boundary line. In this area the company hopes that some high-grade ore, similar to that at the Teck-Hughes, may be found. When the winze is completed to 3,600 ft., and three new levels have been opened, sinking will be continued to 4,000 ft., which will be reached some time in October. At this depth, crosscuts will be run to the south, and diamond drilling will be done to a depth of 6,000 ft., the greatest depth which any mine in Canada has yet reached.

The first of the six new levels of the Teck-Hughes to encounter ore in the crosscut is the No. 20; three rounds have been taken off the vein, two of which show high-grade ore, but assays are not yet available. The crosscut is also being driven on the No. 25 level and should reach ore during the first week in June. With these two levels in ore, two other crosscuts will be started until the six new levels are finally in operation. The amount of crosscutting in barren rock at any one time is limited by the capacity of the shaft for handling ore and waste.

Hinsdale Adds to Holdings

Hinsdale Mining, Milling & Smelting has acquired the holdings of Mount Runletts Mining, 30 miles north of Bayfield, Colo. Hinsdale now has a total of 3,000 acres in the Cave Basin district. Development work on these properties will be continued. L. M. Maitland, of Drake, Colo., is president of Hinsdale.

Greene Cananea Concentrator to Handle 3,000 Tons Daily

REMODELING of the Greene Cananea concentrator, in northern Sonora, Mexico, is expected to be completed by the end of 1929, when the plant will have a total capacity of more than 3,000 tons daily, according to W. D. Thornton, president of the company. In 1928 it handled an average of about 1,700 tons daily. One section of the plant has already been remodeled. The crushing and sampling plants will be rebuilt, new ore bins erected, and the railroad approach improved. New high-pressure waste heat boilers will be installed at the reverberatory plant to harmonize with the power plant, which is being greatly improved, and its capacity increased, by the installation of high-pressure direct-fired boilers and a 6,000-kw. turbine.

New stopes are being opened at the Colorada mine as rapidly as safety will permit, but it is not yet producing at capacity. During 1928 a total of 248,782 tons of ore was shipped from this mine, although the first stopes were started in August and the mine was not on a production basis until October. As most of the work in the Colorada has been incidental to stoping operations for the last year or so, very little development work has been undertaken. A drift has been started on the No. 13 level, however, to prospect the territory lying between the Colorada and Veta Grande mines.

Production from the Cananea-Duluth mine will start by the end of this year. New equipment is being provided, and the shaft is being unwatered, retimbered, and deepened. This mine has been idle since the destruction of the surface plant in 1923 by fire. As soon as this work is finished, power will be available for prospecting the Sonora Hill area by underground workings. Several million tons of concentrating ore was indicated by churn drilling in this area in 1923. Geological conditions are apparently similar to those at the Colorada mine.

Pacific Copper to Enlarge Its Shaft, Near Lordsburg

Directors of Pacific Copper have authorized widening of the No. 2 shaft of the Bonney mine, operated by the company in the Lordsburg district of New Mexico, to a three-compartment shaft.

Shipments from the mine during April netted the company $30,000. Output is now about three carloads of ore daily.

Will Start New Mill in the Superior District

Operation of the 50-ton mill built by Midnight Test Mining near Superior, Ariz., is expected to start about June 5. In the meantime shipments of high-grade ore are being made to the smelter. A new tramway has been completed to handle the ore from mine to mill.

Part of the tungsten property of the Stoody Company, near Yucca

50-Ton Mill to Be Built at Yucca Tungsten Mine

WHAT has been reputed to be the largest single tungsten-bearing deposit in the United States was recently acquired by the Stoody Company, of Whittier, Calif., as mentioned in these columns in the May 11 issue. This deposit, situated in the Wallapai Mountains, 50 miles east of the California-Arizona boundary, and 18 miles northeast of Yucca, in Mohave County, Ariz., was worked for a time during the World War, but has since been idle, according to Miles C. Smith. The new owners are installing a 50-ton Diesel-engine driven mill at the property, and will ship the concentrate to the plant at Whittier for electrolytic refining.

The property was purchased outright by the Stoody Company, which has done considerable work in the development of hard-facing alloys as well as metallic "diamond substitutes." It comprises fourteen claims, totaling 280 acres, and will be operated under the name of Boriana Mining. Wolframite ore has been found in perpendicular veins, 6 in. to 4 ft. wide. A tunnel will be driven a distance of 1,500 to 2,000 ft. into the mountain to intersect the main orebody. Chutes will be driven upward into the orebody from the tunnel, and the ore will be loaded into trams for haulage to the mill.

A road has been constructed from the property to Yucca, where facilities for transporting concentrate on the Santa Fé Railroad are available. Trucks, which will also be used for the transport of fuel and supplies, will take the concentrate to the railroad. L. B. Rece will be in charge of operations.

Strike Ore Near C. & A. Boundary in Denn Mine

ABOUT 800 ft. west of the shaft on the 2,200 level of the Denn mine of Shattuck Denn Mining, in the Warren district of Arizona, ore said to average 9 per cent copper has been found for a distance of 20 ft. in the drift being driven to connect with the Calumet & Arizona workings at the Junction shaft. This drift will provide drainage for the Denn mine. The new strike is believed to be an extension of the main orebody, which has already been struck in other parts of the 2,200 level. Ore has also been found in the drainage drift in C.&A. ground at this level.

About 350 tons of copper ore daily are being hoisted from the Denn mine and about 100 tons from the Shattuck mine, of Shattuck Denn Mining. This ore averages 6 per cent copper and is treated at the Douglas smelter of Calumet & Arizona. Lead ore from the Shattuck mine is shipped to the Phelps Dodge smelter. Stopes are now being opened up at the Denn mine, and the company hopes to step production up to 500 tons daily in the fall.

Erect 85-Ft. Headframe at Eureka Standard

AN 85-ft. headframe is being erected at the Eureka Standard property of Tintic Standard Mining, at Dividend, Utah, in the Tintic district. Skips will be used instead of cages. A Wellman-Seaver-Morgan electric hoist and other equipment is being installed preliminary to deepening the shaft now down 1,155 ft. The orebody is being developed in a winze below the 1,200 level.

The oreshoot in the Eureka Standard has been proved for a length of 450 ft., an average width of 6 ft., and from the 1,100 to the 1,220 level. The ore averages $15 a ton in gold and 10 oz. of silver.

Ship Gold Ore to Leadville

Silver-gold ore from the Sarsfield claims, on North Star Mountain, in the Alma district of Colorado, will be shipped to the Leadville smelter of American Smelting & Refining by Consolidated Mining & Milling. Jack Flannery, vice-president of the company, is in charge of operations, which were started early this year.

Nevada Companies Stipulate as to Mining of Claims at Ely Until October

Pending Final Hearing on Oct. 21, Nevada Con. May Continue Shovel Operations in Portion of Liberty Pit Involved in Suit —Con. Coppermines May Extract Some Ore Underground

AFTER listening to statements of counsel in suit brought by Nevada Consolidated Copper against Consolidated Coppermines in the U. S. District Court at Carson City, Nev., on May 21, in which the plaintiff asked for preliminary injunction, the court suggested that the parties endeavor to stipulate concerning restraints to be imposed pending final trial. Adjournment was taken, and after negotiations had continued for a day and a half, the parties appeared in court and filed a stipulation covering their respective operations pending final hearing, which was fixed for Oct. 21, 1929. An order of court was then entered in accordance with the stipulation, which provides that in the interval Nevada Consolidated may continue shovel mining and stripping operations in the portion of its Liberty pit, at Ely, Nev., involved in the suit. This company agrees, however, not to extend the upper perimeter of the pit further west by removing or stripping ore above the fourth level bench of the pit, west of the contract plane. In the interval it will not mine more than 300,000 tons west of the contract plane in the Champion and Liberty claims. Mining by Nevada in other parts of the pit, and in the area containing the boundary and "drag" ores—which Coppermines claimed a right to mine by underground methods—is to be continued without limitation until Oct. 21. Nevada Consolidated will keep a record of ore tonnage mined in disputed territory in the interim, and if, when the final trial is held, it is determined that Coppermines had the right to mine any of such ore, Nevada Consolidated will pay Coppermines 16c. per ton as profit to which the latter would have been entitled for mining the ore itself under contract.

During the interval Nevada agrees not to extend underground development on its 6,470 level from the east closer than 275 ft. to the contract plane, nor to mine any ore by underground methods on the eastern side of the plane closer than 400 ft. to the plane. On the 6,560 level, Nevada may complete underground development of the whole of its 3-a block of ore, and may carry on any other underground development work on that level which is more than 275 ft. east of the contract plane.

Coppermines, according to the agreement, may continue driving underground development drifts from its Emma-Nevada shaft on the 6,470 level in the disputed territory, but it must not put up any mining raise or mine from that level in either its own or Nevada's territory. Coppermines is given permission to drive one or two raises up to the 6,560 level for development purposes in certain restricted areas, but is to do no mining on that level closer than 400 ft. west of the contract plane. It might be well to mention that the numbers of the levels at Ely represent altitude above sea level rather than depth from the surface, as is more customary.

Coppermines is given permission to mine in what is known as the West Side block on the 6,660 level of the Champion claim and in Block 6-a on the 6,560 level in the Champion or Liberty claims of Nevada, but not closer than 400 ft. west of the contract plane. Coppermines cannot mine more than 2,000 tons of this Nevada ore daily. This company also agrees not to do any mining in its Ora claim nor anything that will tend to cave, injure, or destroy Nevada's Liberty pit or interfere with its pit operations.

The Wedge shaft and Liberty pit of Nevada Consolidated

Nevada agrees to furnish Coppermines with additional power to the extent of 500 kw. pending the trial, on the same terms as the power now being furnished under the contract in controversy. Coppermines may synchronize power obtained from Nevada with the power system connected with its Diesel plant.

Nevada will furnish Coppermines with 25 per cent of its available supply of domestic water up to a maximum of 80,000 gal. daily, at 30c. per thousand gallons, payable monthly. Other rights and situations arising under the contract will not be affected by this stipulation, and neither the stipulation nor operations thereunder shall in any way prejudice the claims of either party. Each company reserves the right to thereafter recover any damages or profits to which it may be entitled by reason of the stipulation or the restraint imposed thereby. In other words, the stipulation is merely one which will enable continuation of operations on the territory under dispute until the dispute can be settled.

Officials of Nevada Consolidated present at the trial were W. S. Boyd, assistant managing director, with headquarters in San Francisco; C. B. Lakenan, formerly general manager of the Nevada properties; J. C. Kinnear, the present manager of the Nevada properties; and W. S. Larsh, general superintendent. Howard D. Smith, president of Coppermines, and Joseph B. Cotton, general counsel, who went to Reno from New York, and J. B. Haffner, general manager of the company's properties, represented Consolidated Coppermines.

After the stipulation had been presented, the court congratulated both parties on reaching an agreement and hoped that a permanent agreement could be effected before Oct. 21.

Mr. McGraw Gives $50,000 to Engineering Library

AT THE tri-annual meeting of the Engineering Foundation, held in New York, May 23, an announcement was made by H. W. Craver, director of the Engineering Societies Library, of a gift of $50,000 to the library endowment fund by James H. McGraw, chairman of the board of the McGraw-Hill Publishing Company.

Treadwell Yukon Starts Producing at Tybo

Operation of the new concentrator built by Treadwell Yukon to treat silver-lead-zinc ore at Tybo, Nev., has been started. About 50 tons of concentrate will be produced from 250 tons of material treated daily as soon as capacity operation is attained. Zinc concentrate will be shipped to the Sullivan Mining electrolytic zinc plant, in the Coeur d'Alene district of Idaho.

Financing Provides Nearly $20,000,000 for Equipping Rhodesian Copper Mines

Roan Antelope, N'Changa, and Border Concession Obtain Funds to Bring Properties to Production Stage—Current Results of Drilling Show Continuation of Large Orebodies Found

By George L. Walker
Special London Correspondent

FINANCING plans recently announced will provide three Northern Rhodesia copper companies with about $19,500,000 of new money for exploration, development, and equipment purposes. Of this total Roan Antelope Copper, by the issue of 1,139,033 shares at 39s. each, raises $10,744,615 to open and equip the mine, complete the plant, and bring the property up to an annual production capacity of 110,000,000 lb. Rhodesian Congo Border Concession, Ltd., will sell 299,871 shares at £5 each, and N'Changa Copper Mines, Ltd., 300,000 shares at £3 each. As the former will take 100,000 of the latter's offering, and also presumably subscribe for 75,000 additional shares as a stockholder, the net amount of money to be raised through this financing is about $8,750,000, each of the two companies being provided with about $4,375,000 for working capital.

When the British group that took over the financing of N'Changa was first announced, it consisted of six companies, Rhodesian Anglo-American, British South Africa, British Metal, Johannesburg Consolidated Investment, Rio Tinto, and Union Corporation. It has now been increased to nine members, two companies, Anglo Metal and Minerals Separation, and one firm, N. M. Rothschilds & Sons, having been added.

N'Changa is, of course, a property of proved value. Drilling on what is called the "Dambo" side of its synclinal deposit is said to have outlined tens of millions of tons of ore by now, and the latest hole to be reported cut 110 ft. (true width about 100 ft.) averaging 4.82 per cent copper.

The ore so far proved by N'Changa contains sulphides, oxides, carbonates, and silicates of copper. As the drills cut the formation at greater depth, the proportion of sulphides increases, such minerals containing 58.9 per cent of the copper revealed by the latest hole. The expectation is that at still greater depth the ore is wholly sulphide.

Meanwhile, tonnage is being proved up rapidly by underground development of the main (sometimes called "River") lode, which seems to be a U-like fold along the opposite side of the syncline from the "Dambo." There the ore has been developed for about 1,000 ft. along the strike on the 300 level; it is chiefly sulphide, and seems to average well over 4 per cent and to be 50 ft. to 60 ft. wide. Shaft sinking is being resumed with a view to developing this ore further on the 600 level.

Geological investigation, already supported by extensive drilling, indicates an ore area approximately three miles long, with two apparent outcrops that spread apart from about 3,000 ft. at one end to about 7,000 ft. at the other, in which the mineralization is continuous throughout, and widths range from 50 ft. to more than 100 ft.

The plan to have N'Changa take over from Congo Border a large area to the west known to carry the extension of the former's ore deposit has been abandoned for the present. It is thought to be more just to both companies for the latter to develop the ground and prove its value. N'Changa has enough without it, and it quite likely may be found of sufficient size to warrant separate development and equipment.

The fact that the property of about 52,000 square miles over which Rhodesian Congo Border holds an exclusive prospecting concession is unproven should be understood. The company's holdings of N'Changa stock, the disclosures in two drill holes on the extension of the N'Changa orebody, several mineral discoveries, all that has been learned during the last five years of prospecting, the company's organization and equipment, and the large amount of money it will soon have in hand are other assets.

Of all the foregoing, the information that has been acquired is by no means the least valuable, as from it an accumulation of knowledge has been built up that indicates the best portions of its vast area to prospect.

Apparently, mineralization occurs in Northern Rhodesia along a series of belts. On one of these belts, that in which six mines are already practically assured, Rhodesia Congo Border owns 60 miles south of the N'Kana concession and also a vast area to the northwest of it. In all probability this belt will be carefully and thoroughly prospected and explored.

Other properties in the Northern Rhodesia group are continuing to develop favorably. Roan Antelope's orebody may be found to persist in width and grade for the amazing length of eight or nine miles, according to present indications. Nothing even suggestive of a lean streak has been encountered. A hole now being drilled is six miles along the strike from the southeast end of the deposit. It had reached the formation at a depth of 560 ft., had cut 9 ft. of sulphide ore averaging 4.70 per cent copper, and was still in ore when last reported.

Another very deep hole has just been completed at Bwana M'Kubwa's N'Kana property. Drilling vertically, the ore was reached at 1,100 ft., then followed 21 ft., true width, averaging 4.57 per cent copper.

Rhodesia Selection Trust reports that borehole No. 10 at Mufulira indicated 31.10 ft. of 2.87 per cent ore. All the other holes cutting the formation in this property found the ore nearly double that width and grade. At Rhodesia Selection's Chambishi property, borehole No. 22 revealed 78.1 ft., drillhole thickness, of ore averaging 3.08 per cent copper.

Montana Idaho Mill Now in Operation With Flotation

AFTER carefully tuning up, the new flotation plant at the Spring Hill mine of the Montana Idaho Mines Corporation, near Helena, Mont., is now in operation, treating 140 tons of gold ore per day. The change from cyanide treatment to flotation was made at the suggestion of W. L. Zeigler, of Hecla Mining, and L. O. Howard. Flotation concentrate is averaging about $100 per ton.

At the mine the company has been conducting an exploration program which is reported to have disclosed ore of better grade than that now being sent to the mill. At the properties in Winston, Mont., the 3,400-ft. tunnel being driven to tap the orebodies at depth was advanced 180 ft. last month.

Douglas Bill Opposed by Sacramento Chamber

The Douglas bill, H.R. 15,919, providing for a more liberal operation of patent proceedings with reference to mining claims, is opposed by the department of mines and mining of the Sacramento Chamber of Commerce. A resolution has been prepared and will be sent to Congress. The contention is that the proposed bill will not aid mining, will eliminate the prospector, will allow the holding of vast areas of public lands upon which no discovery of mineral has been made, and would further wildcatting and visit actual fraud upon potential investors.

Beard Leases Jimulco Mines

John W. Beard has leased the Jimulco copper mines, at Estacion Otto, Coahuila, Mexico, from the Compañia Minera Peñoles, American Metal subsidiary, which has been operating the properties under lease since July, 1924. George Butler, Jr., is in charge of operations for Mr. Beard, who is a resident of El Paso. The Jimulco mines are 50 miles south of Torreon and are connected with the National Railway by a 5-mile narrow-gage line.

The Hercules mill, near Wallace, Idaho

Additions to Hercules Mill to Be Completed in July

ADDITIONS to the Hercules mill, at Wallace, Idaho, which will raise its capacity to about 1,000 tons of silver-lead ore daily, will be completed in July, according to reports from Spokane. The mill has been handling about 700 tons daily from the Tamarack, Sherman, Dayrock, and other mines controlled by Day interests in the Coeur d'Alenes.

A strike made in the Tamarack mine about two months ago has occasioned considerable interest, although very little information is obtainable. Drifting on the 1,200 level has followed ore for more than 100 ft., averaging about 5 ft. wide. At the Sherman, an oreshoot, which is believed to be the one discovered in Oreano ground, and claimed by both the Sherman and Oreano companies, has been followed for a distance of about 1,000 ft. This discovery is on the 1,200 level, which, under the inverted system of numbering used at the Sherman, is the highest level in the mine.

Vancouver Interests Buy Mine in Pend Oreille Area

A CONTROLLING interest in the Red Bird mine, near the junction of the Pend Oreille and Salmon rivers, in British Columbia, has been acquired by Vancouver interests, headed by R. H. Stewart, former general manager for Consolidated Mining & Smelting, according to an announcement made by L. E. Beeston, president of the Red Bird company. This property is near the proposed hydro-electric power station being built by West Kootenay Power & Light and also near the branch line of the Canadian Pacific which will be built from Trail to Metaline Falls, Wash., this fall.

At the Red Bird, the vein has been exposed by a series of open cuts for a distance of 3,000 ft. and by a tunnel at a depth of from 160 to 300 ft. for a length of 1,500 ft. The vein is said to average 20 to 25 ft. wide. Ore includes lead and zinc. Diamond drilling and a new tunnel, which will strike the vein about 700 ft. below the surface, will be started at once by the new interests, which have allocated $50,000 for this purpose.

Wilbert Mine Operating With Electric Power

MACHINERY at the Wilbert mine, Arco, Butte County, Idaho, is now being driven by electricity. Connection of the mine with the Utah Power & Light Company lines, J. A. Foley, president of Wilbert, estimates, will reduce the company's power bills by at least $1,000, as compared with those incurred with oil-driven engines. Net earnings of the company for April were about $15,000. A report by Mr. Foley to the directors on May 21 showed the company had $32,000 cash in the treasury, and no indebtedness other than current wages and small items. In addition, the company had ore in transit valued at $10,000.

The south winze has been sunk to the 1,450 level, where the whole bottom is in high-grade silver-lead ore. Drifting will start to the north to open up the oreshoot exposed on the 1,350 level for more than 300 ft. The width ranged from 5 to 8 ft. in the last 80 ft. of drifting to the north.

Peru Mining to Enlarge Mill to 300 Tons Daily

Construction of an addition to the zinc concentrator of Peru Mining at Deming, N. M., will be started soon, according to L. E. Wemple, president of the company, which is a subsidiary of Illinois Zinc, at Peru, Ill. The capacity of the plant will be increased from 200 to 300 tons daily.

The Peru Mining Company is operating zinc mines at Hanover, in the Silver City district, and in addition to its own ore it has been handling some custom ores. Concentrate from the plant at Deming is shipped to the Illinois Zinc smelter at Peru.

Missouri Mining Builds Test Mill on Jasper Lease

MISSOURI Mining has completed a 100-ton test mill on the Jasper Mining Company's lease, west of Joplin, Mo., and will make a test run of the ore mined during development work for about a year to determine the grade of the ore. If after the year's run the grade proves sufficient, Missouri Mining will join Jasper in operating the plant.

The Jasper lease is known as the old A. W. C. tract. The Jasper company, owned by C. F. Dike and others interested in the Interstate Zinc & Lead Corporation, has purchased 270 acres in fee in the west Joplin district. Development work has been carried on for the greater part of the last three years. More than 1,000 ft. of crosscuts were completed, and sampling showed ore running high in lead.

The Jasper company had plans drawn for a huge steel mill for the mine two years ago, but never completed the financing of the project. United Verde Extension had at one time contemplated joining the Jasper in the mine. It is presumed that, if the test mill proves successful, Missouri Mining, a subsidiary of the Consolidated Goldfields of South Africa, will join the Jasper in the erection of a large plant on the tract. Mr. H. Loveman is manager of Missouri Mining's Joplin properties.

St. Louis S. & R. Puts New Mill Into Operation

The new No. 8 mill of the St. Louis Smelting & Refining Company, National Lead subsidiary, one of the largest and most complete concentrating plants in the Tri-State district, has been placed in operation. Of all-steel construction, the plant is expected to handle close to 100 tons of ore an hour. The property is in the so-called Baxter sheet-ground district, and although carrying low-grade ore, it is expected that the mining of the property on a large scale will make it highly profitable.

Mount Elbert Stops Dredging

Mount Elbert Gold Dredging, operating near Leadville, Colo., has sold its dredge to Cloud River Mining, a Canadian company, for a consideration reported to be $50,000. The dredge will be dismantled and shipped to Canada. Mount Elbert was organized in 1923 to acquire the property and dredge of Derry Mining & Land, which owned about 2,040 acres of placer ground on Box Creek, 12 miles south of Leadville.

Drifting at Park City Con.

Drifting on the 200, 300, 350 and 400 levels of the Park City Consolidated property, at Park City, Utah, is now under way. Some ore is being taken out for shipment. A new electric hoist is being installed.

Industrial Journalism and Engineering Advance

An Address by JAMES H. McGRAW

Chairman of the Board, McGraw-Hill Publishing Company, delivered to the students of the Princeton School of Engineering, May 14, 1929, being one of the Cyrus Fogg Brackett lectures.

INDUSTRIAL JOURNALISM is an intimate reflection of the economic progress of the American people. It is a natural expression of this great era of science, industry and commerce. It is a product of the expansion of our modern civilization.

It has been well said that civilization began with the first recording of experience. For not until one generation could profit by what the preceding generation had done could there be progress. In ancient times this recording of experience was restricted to the realms of human emotions, of government and of religion. But when the world turned its mind to the practical service of humanity by the increase of wealth, the relief of want and the creation of new comforts, men began to store up their experience in the ordinary occupations of life. And with this knowledge came new power to produce and to provide.

The practical applications of science and engineering began only about 75 years ago. That was the beginning of industrial journalism. But 80 per cent of America's wealth has been created since 1900. This astounding acceleration in the affairs of man, this tremendous contribution to human welfare, has only been possible because the way has been found to co-ordinate the work of the world. The greatest single influence to this end, I believe, has been the exchange of intelligence, and in this service, engineering and industrial journalism have played an important part.

The coming of the industrial press, of course, was impulsed by the same influences that brought the newspaper into the world. When the leaders of a village could no longer meet together in the store and swap the news and settle the affairs of the community, because the town had grown too big, a paper appeared. And when industry began to specialize and introduce the scientific method, men with common problems sought each other's help in the same way. They wanted to know what was going on in their profession or their trade, what the leaders in their field were doing and thinking, what was happening that affected the market. And they too wanted a paper because the people of an industry form a far more scattered community than the most straggling town.

The beginning of industrial journalism was primitive. The editor's idea was to print a news sheet that would convey the gossip of the month or week. A certain amount of advertising was necessary if expenses were to be paid, but at first it was sincerely deprecated. The other day I ran across an editorial clipped from the *American Machinist* of March 20, 1880. It apologized for what it termed "the crowded condition" of its advertising columns. "Our limited space has been over-crowded for some months past," it said, "and we have been obliged to increase our advertising rates. The *American Machinist* is pre-eminently a reading paper and will be kept so, our intention being to make the paper always of one uniform size; namely sixteen pages." This quotation gives a good picture of the limited editorial conception of the early days of 45 or 50 years ago.

This sounds ludicrous in contrast with the situation today, where the advertising section of a prosperous business or industrial journal is often twice the number of its editorial pages. But it is an interesting fact that the change has come because of the demands of industry itself, because of the needs for improved editorial service and the recognition of advertising as an important force in selling. The basic function of all business is the exchange of commodities. It didn't take long, therefore, in every industry that had a paper, for the manufacturer and the provider of raw materials to discover that the readers of these business publications contributed an audience that embraced a large part of his market. And because of the buying needs of these readers, the manufacturer insisted on his right to talk to them through the advertising pages, of course for a consideration.

Despite the discomfiture of the early editors of the *American Machinist* and other papers of that period, the manufacturer proved that it did pay to advertise, because the publication of the message of the seller was important news to the reading buyer. He found that it satisfied a very practical need, and from that time to now, by constantly demanding broader and better circulation and higher standards of publishing and editorial service, industry itself has forced forward the development of industrial journalism. I emphasize the point, because I think few people appreciate the extent to which a modern engineering or industrial paper is moulded by the needs and demands of its industry. And the editor is more independent of the advertiser than ever before, for the simple reason that he has become a working part of his industry.

It was in that picturesque era of editorial pioneering that I made my advent in business publishing 45 years ago. Like many another lad, I started working for the home town weekly, that was edited by the druggist in my native village in Chautauqua County, New York. My job was to write the school news and local gossip. The principal part of the paper was made up of boiler plate, so-called. Next the principal of my school and I began to labor in our spare time for a monthly publication called *The Countryside*, writing at five dollars a column and selling subscriptions on commission. I continued this work while I finished high school and a four-year state normal school course. While I was still a student, my former high school principal and a friend of his from Chautauqua County went to New York to seek their fortunes and became connected with a new publishing venture in industrial journalism.

These two friends from Chautauqua County, with one or two others, started the *American Journal of Railway Appliances* and purchased a little paper called *Steam*, which they rechristened *Power*. Also in the autumn of 1884 they started the *Street Railway Journal*. I spent the summer vacation of 1884 selling subscriptions for the *Journal of Railway Appliances* on commission. When I discovered that I was making more than forty dollars a week above my expenses, I got the idea that I could make more money in the publishing business than I could by teaching school, although I loved the work of a teacher. I was committed to teach another year for $700, but when the year was over I hastened back to New York and joined the American Railway Publishing Company, publishers of the above-named papers. I sold subscriptions on the three papers and then advertising entirely on commission. I was fearful that I did not have sufficient education to become a teacher of the first rank, and so business became my goal.

I found the industrial editor a rather insignificant figure. In most cases, the publisher was chiefly concerned with getting advertising enough to pay the printer, and at that the printer frequently had to wait. The editor was an item of expense, and his department was not lavishly supported. Paste pot and scissors were his principal tools and write-ups from his advertisers were an important source of material. In fact, no matter how seriously the editor might take himself, it was a common saying, outside his sanctum, that he was wholly a necessary evil required by the postal authorities to enable the publisher to send his paper through the mails at second-class rates.

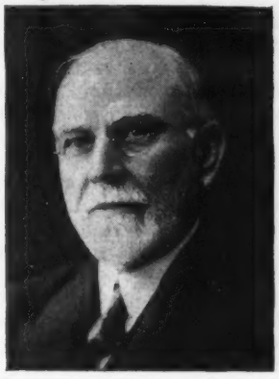
But some of the broader principles were beginning to disclose themselves, and even then we had a vision of future possibilities. It was a struggle, how-

ever, and soon the company owed me $1,500 and a paper bill of $850 or $900, with no money in sight. This was in the summer of 1886 and I was located in Philadelphia. I was called to New York for a council of war and was asked if I could help out by finding some ready cash. Being young and full of confidence, I said "Yes!" without having the remotest idea of where I was to get it.

I took a walk up Broadway to cogitate. Finally I passed the building of the New York Life Insurance Company, and that gave me a thought. I went in and took out a policy for $2,000, payable to James Knapp, a wealthy farmer of Chautauqua County who knew me and knew my family. He asked me what security I could give. I told him nothing but a note and a life insurance policy. To make a long story short, I turned over the life insurance policy and the note to Mr. Knapp and received from him a check for $1,000. I will never forget the words with which the kindly old gentleman consented: "Jamie," he said, "if you will make this a debt of honor, I will loan thee the thousand dollars." The next day I laid a check for that amount on Mr. Swetland's desk. The poor treasurer promptly fell in a faint. I took stock for the $1,000 as well as for the $1,500 due me, and became a vice-president of the little publishing house. That marked a turning point. Two years later we paid a 10 per cent dividend, but it wasn't long before there was a disagreement in the firm and we split on the rock of industrial progress. I often think how prophetic it was of the course which industrial journalism was destined to follow, of its arduous task of keeping pace with the rapid transitions of the last quarter century of industrial progress.

In those days, more than 40 years ago, the *Street Railway Journal* was devoted to the interests of the horse, its care and its car. I was traveling and had become acquainted with the group of men who were fast making the electric street railway an actuality. I became convinced of the impending doom of the horse car and of the cable car, and insisted that the *Street Railway Journal* must have an editor who knew something about electricity. The importance of the real editor was becoming apparent even in those days. Many people maintained that the horse would be able to resist the invasion of electricity, and that the railway companies could not afford to lose the principal byproduct of the horse. You would be surprised to know how many of the old horse car companies made a considerable profit from the sale of manure heaps at the barns. So the firm broke up, Mr. Swetland, the treasurer, buying *Power*. The rest of the property, including the composing room, came to me. My first act was to secure an electrical editor for the *Street Railway Journal*, and developments in that industry rapidly proved the soundness of this viewpoint.

This experience established in my mind a fundamental principle of technical and business journalism that I believe cannot be too seriously stressed in any consideration of industrial publishing. It is the fact that industry is always ready for leadership. The editor's responsibility, in other words, is not merely to reflect current news and opinion, but to provide a vehicle for advancing thought. Forty years ago the principal purpose of the publisher was to make a living. And the editor often took himself more seriously than his real obligation to his industry. But from this very meager beginning of a small paper, with a limited function and inadequate facilities for editorial



James H. McGraw

service, the industrial press has grown, forced by the growth of industry itself and inspired by the scientific and industrial progress of America. The development of power, transportation, electricity, steel, communication—each has brought its stimulus to journalism because of the continuously accelerating need for an organized service of current information. The growth of my own publishing activities has been a natural outcome of the expansion of the industries my papers have been serving and the increasing inter-relationships between industries.

I soon sold the *Journal of Railway Appliances* and a little later purchased a paper called *Electrical Industries*, which was renamed *American Electrician*, and W. D. Weaver, who was editor of *Electrical World*, came with me to be editor of *American Electrician*. Mr. Weaver was one of the few really great engineering editors of the day. He was well read, widely traveled, and an intellectually honest man. He made sure of his ground on any controversial subject and then expressed his opinions in his editorials frankly, fearlessly, and convincingly. He did his own thinking and stood behind it unless better arguments than his own convinced him that he was wrong. Expediency was unknown to him: so was opportunism.

His reputation grew until many of the leading electrical engineers, not only of America but of the world, came to his office to seek his advice and to listen to his judgments. When the first plans for forming the American Institute of Electrical Engineers were being discussed Mr. Weaver had a large part in them, and some of the early meetings of the group were held in his office. That interest in technical societies is typical of the technical journal. Twenty years earlier the preliminary meeting of the founders of the American Society of Mechanical Engineers was held in the office of the *American Machinist*. Much the same sort of a story could be told of the starting of the American Society of Chemical Engineers in the office of the progenitor of *Chemical & Metallurgical Engineering*.

Meanwhile we had acquired other papers — *Electrical World* and *Electrical Engineer*, the two leading weeklies of the electrical industry, which we consolidated into one, and which is the present *Electrical World*. We also acquired *Engineering Record* in 1901 and established *Chemical & Metallurgical Engineering* and *Electrical Merchandising* a little later.

In 1916 came the death of John A. Hill, who, shortly after my own entrance into business paper publishing, left the throttle of an engine, in the Far West, and came East to work on a locomotive paper of that day. He had courage, perseverance, and ability, and it was not long before he owned the paper and was on the way to becoming a great publisher. By 1915 he had acquired five technical and industrial papers—*American Machinist, Power, Coal Age, Engineering News* and *Engineering and Mining Journal*. These papers were leaders in their fields. One morning a heart attack carried him off just as he was starting for his office. Not many months later, it was found expedient to merge the Hill and McGraw Publishing companies. The *Engineering Record* and *Engineering News* were combined, and the McGraw-Hill organization started operating with nine national publications serving engineering and industry; some of these publications were international as well. In twelve years we have seen our nine papers grow to twenty-six, as we have sensed new needs within the industries we already served and have seen opportunities for extending our work into other fields that were inadequately provided for.

Our development has followed a very logical course, founded on the five major engineering professions and the industries allied with them. So, as the bus took its place as an agency of highway transportation, we launched *Bus Transportation*. To aid the increasing mechanization of food processing, we provided *Food Industries*. We started *Radio Retailing*, as a trade paper, to help in the stabilizing of that vigorous young industry. We extended our service to the textile industry by acquiring the *Textile World*. We expanded our coverage of the industrial field by purchasing the two competing papers, *Factory* and *Industrial Management*, and combining them as a production management paper, and also by establishing *Industrial Engineering* in the field of factory maintenance and operation. We entered the broad realm of business pol-

icy by adding the *Magazine of Business* and *System*.

So much for the story. Now, why have I been telling it to you young men of Princeton? I think it is because all of us are interested in the same engrossing study right now—in education. For Princeton and McGraw-Hill are both educational institutions. Here in this great university you are engaged in the processes of academic education, in building up a background of knowledge for thousands of America's best young men, teaching them values in life, training them in the art of orderly thinking. When they leave these halls of learning, their academic preparation is complete. Yet you know, and I know, that no matter what professional, industrial, or business occupation they may engage in, a new process of education begins immediately. Nothing in life is fixed. Everything changes. Therefore, progress is achieved only by men whose knowledge is progressive, who learn to work and by their use of knowledge master the power to render constructive service and to contribute creative thought. And it is in this universal college of practical affairs that the institution of the press plays its part, presenting a cumulative curriculum of current experience and advancing thought to the student classes of the working world.

This, in a word, is the purpose of the modern business publication. This purpose may be broken down under three heads—

1. To collect and disseminate experiences of those engaged in a certain industry, profession, or trade.

2. To act as an interpreter of events and developments.

3. To serve as a leader of sound thought and policy.

All of these functions are important, but that which distinguishes a great paper from an ordinary one is the extent of the leadership that it exercises. And this leadership to be in balance must in turn provide three distinct services—

1. It must satisfy the needs of the reader and promote his progress.

2. It must establish a circulation that will present to the suppliers of service and equipment to that industry or profession a selected audience that represents the responsibility and buying power of that field.

3. It must provide for the advertisers to that industry a practical guidance that will assist them to the successful development of their markets and to the profitable presentation of their products.

In other words, the modern business paper has not only assumed the function of providing a source of news and education but has taken upon itself the rôle of a marketing counselor as well—such is the spirit of the times.

And so we find this publishing operation a highly organized personnel divided into these three departments. The business staff is engaged in the study of products, the determination of markets, the development of advertising appeals, the suggestion and preparation of copy for advertisers, and co-operation in customer sales programs. The circulation staff is focused upon the continuous analysis of the readers of the publication, seeking out those units of executive influence, operating responsibility, and buying power that will broaden the service of the paper; and avoiding waste circulation that will but burden its distribution and bring little value to the industry. McGraw-Hill subscription salesmen constantly travel the country by train, bus, motor, and sometimes by airplane, running down these selected prospects that should be numbered in the audience of this or that paper to make a richer readership. The advertising of our individual publications and of our institution, in general magazines, in selected business papers—our own and others—and by direct mail, supports and stimulates all this selling and is a considerable activity in itself.

But the life of every business publication centers in its editorial staff, and the work of the editor entails the exercise of a high professional standard. For while the business of publishing is a commercial enterprise, at its core it is professional. If the commercial should dominate, the enterprise would lose in public confidence. Always we must conduct it with an eye single to the interests of the reader. We must keep covenant with him. To a high degree, therefore, the editor is a working member of his industry and must be a part and parcel of it. McGraw-Hill editors hold active membership in 88 engineering and industrial societies and at the present time are serving on 106 committees of these organizations. In this way they are in intimate contact with the men who are doing things and are themselves participating in development by passing critically in committees upon new industrial and engineering developments. We have had the honor and privilege of having McGraw-Hill editors elected to presidencies and directorships in the American Society of Mechanical Engineers, the American Electro-chemical Society, the Mining and Metallurgical Society of America, and other important organizations. Our editors are authors of 112 standard textbooks on engineering and industry. I mention this merely to illustrate the extent to which the work of the modern editor must carry him into the affairs of the field he serves. I am firmly of the opinion that this improvement in the status of the editor since the early days when he sat at his desk and wielded the shears has been reflected in the greater prestige and authority now enjoyed by the business press.

For the modern editor is a traveling man. He must know his field at first hand. To understand conditions he must see them, and to hold the confidence and friendship of the men who constitute his industry he must visit with them and view the prospect from where they themselves are sitting. A recent calculation showed that the combined peregrinations of all our editors within a twelve months' period would have spun a skein of travel twenty-three times around the world.

But I will not weary you further. The glory of an editor lies in the editorial excellence of his paper. He must not only provide the news, through a well-organized staff and his network of observant correspondents throughout the country, he must record experience, stimulate discussions, crystallize opinion, interpret trends, and guide the course of advancing thought. He must of himself bring leadership of a high order. To do this he must have knowledge, energy, enthusiasm, and executive ability. He must also have courage. He must know when and how to speak. The "however and nevertheless" style of journalism is as insipid in industrial papers as in any others; silence in the face of abuses or perils is as cowardly. But energy must be coupled with judgment; and without imagination and vision the editorial mind would be sadly incomplete. The editor needs these qualities: first for his paper, that he may carry it to ever greater fields of usefulness. He needs them for his industry, that he may help it to build not for the next year or the next, but for the children yet unborn and the children of the unborn. He needs them for the nation and for humanity, that a high patriotism and the love of mankind may inspire his efforts and round out his character. He should be able to interpret his industry in terms of human life as well as by more material measurement. They must be something more than scribes or anonymous laborers in a publishing house, these editors. Some of them have indeed been leaders in the past. Some of them are leaders today. Some will be leaders in the future. Such men will make their papers human, vibrant with life, instinct with the sense of a mission.

Perhaps much that I have said will seem like counsels of perfection, impossible of attainment. But are not such counsels the only ones worth giving?

At the risk of being accused of mental bias, because my whole life has been spent in engineering and industrial publishing, I want to say to you gentlemen that I am convinced that no field of endeavor holds more of opportunity for the young engineer than does this one. I am not an engineer myself, but I have been working with engineers for 45 years, and engineers have been working with and for me. In that time we have seen American industry stir itself as from a long sleep, awaken to its responsibilities and opportunities, and forge ahead at a pace that grows steadily swifter. It has been our task to record this advance, to keep pace with it in our own development, and to guide it along right lines.

To be an active participant in this amazing industrial activity is a privilege for any red-blooded individual. To be an observer, a counselor, a guide to this activity is quite as fascinating a career.

MARKET AND FINANCIAL NEWS

Dissatisfaction With Copper Situation Reported From Europe; Zinc Production Facilities Expanding

By Dr. James Rubinfeld
Special Berlin Correspondent

SINCE the beginning of April metal markets in Germany as well as in the rest of Europe have been very quiet. Prolonged sittings of the reparation experts at Paris, appreciable enhancements of money rates in New York, and the current difficulties in floating European loans across the Atlantic, distrust of the "managed" trend of metal markets on account of alleged arbitrary price fixing, the revival of metal bourses in Europe and even in New York, with some increase of bear operations, and many other factors, combine to make business men unusually cautious in making commitments. There is no doubt here that the big blunders in driving the copper price to unforeseen heights which were a feature in the memorable month of March ought never be repeated if the very sensitive European markets are not to be shattered. Albeit the amount of unfilled orders over there is known here to go into hundreds of thousands of tons, it is a matter of fact that offers of copper appreciably below the c.i.f. quotations of the Brussels cartel are by no means rare. One may well wonder where the speculatively sold metal will come from after the three months' lapse for delivery. Rumors are spread in Germany that Mr. Kelley, of Anaconda, will soon come to Europe to talk with chief representatives of the European copper manufacturing industries about the future policies of Copper Exporters, Inc., and especially about the true meaning of the now generally distrusted "price stabilization," the banner word of the cartel at its outset. It is well to remember that the cabled protests of German manufacturers to New York were on behalf of users of about 200,000 metric tons of copper annually in Germany alone and were backed, so I learn, by the Paris Chambre Syndicale des Metaux, the interests of the British Imperial Chemical Company, and other groups.

It is a sign of the times that a lot of European manufacturers of high standing are beginning themselves to foster propaganda for aluminum. The biggest electric concern of Germany, that of Siemens, in Berlin, is now boosting the aluminum alloy "aldrey," which is being manufactured by the Vereinigte Aluminiumwerke A. G. of Lauta according to patents of the Swiss Neuhausen company, for open-air cables and many other purposes which hitherto were restricted entirely to copper. There exists an advisory council (Aluminium-Beratungsstelle) in Berlin for the systematic substitution of the "inland" metal (this word must be taken, of course, *cum grano salis*, since bauxite must be imported) for the "foreign" copper, and let me emphasize on this occasion that the propaganda of the above named Berlin semi-official body is effective and that a number of consumers have, in the meantime, shifted from copper to the light metal, which in many an instance works out 50 per cent cheaper on the basis of volume.

The "flutters" of great electric combines should not be put aside scornfully, because it is especially the spreading electrification of the world to which the hopes of the producers of copper are fixed. The French Compagnie Générale d'Electricité has just held its general meeting. The president, M. Pierre Azaria, urged the case of aluminum against the policy of the copper cartel in a very firm tone, outlining the alleged present necessity to form a strong front against the American copper producers. Such instances could be repeated, but, on the other hand, it is a gross but welcome exaggeration to generalize the net cost of, say, the Utah Copper Company of 5.6c. or, for the last year, 6.3c. a pound, in order to demonstrate to the European public the profiteering policy of the Americans. I give these details in order to show to your readers the present mood of European copper users against the American producers.

Copper smelting and refining facilities in Germany have increased further. During the first quarter of this year 112,437 tons of copper ore have been imported, against a net import of 79,154 tons in the same period of 1928. The more the inland production of copper increases, so it is hoped, the greater will be the independence of the bourses of Berlin and Hamburg, and, as a matter of fact, hedging facilities have been lately much broadened here by the admission of stock brokers and jobbers to membership. A considerable volume of the German copper output offers hedging facilities now, so that even the London Metal Exchange sometimes avails itself of such help in times of shrinking supplies. Hamburg is best situated in this respect on account of the proximity of the Norddeutsche Affinerie (Metallgesellschaft).

German zinc production capacities are increasing steadily also. In April, 1929, the output was 8,673 tons, compared with 8,657 tons in March. The Aktiengesellschaft für Bergbau, Blei und Zinkfabrikation zu Stollberg at Aachen (Rhineland) produced 22,116 tons of zinc in 1928 as well as 29,041 tons of soft lead, 35,462 kilos of silver, and 1,400 kilos of quicksilver. Nearly all slab zinc produced was derived from domestic ores. The desire to increase domestic production has been the reason for the erection of the new Giesche electrolytic plant at Magdeburg, which is to fill the uncovered half of German zinc requirements. Combined with the Magdeburg plannings of Giesche, a holding company, "Non Ferrum," and another undertaking, "Financière Mircantile," were organized recently at Zurich, Switzerland, for financing purposes. So long as the new Magdeburg refinery of Giesches Heirs, with its initial capacity of 60,000 tons a year from 1932 on, is not ready, Germany, it would seem, ranks even behind the single firm of the Liege Vieille Montagne in zinc production. The latter reports that its part in last year's world output of primary zinc was 7.8 per cent, whereas the German participation therein was only 6.9 per cent. But the percentages are bound to shift quickly as reorganization of the industry in Germany proceeds.

Polish Giesche Spolka Akcyjna, in which Anaconda Copper holds a majority participation, is reported to have been authorized by the Brussels Zinc Cartel, on the occasion of the recent renewal, to a free production of 1,600 tons of electrolytic zinc monthly in view of its transition to electro output. La Vieille Montagne, the general manager of which presides over the "Entente Mondiale du Zinc" (Zinc Cartel), is increasing further its production and expects to reach the total of 125,000 tons in 1929, against the 110,000 tons outputted in 1928; 29,000 tons in 1919, and 100,000 tons in 1913. La Société Royale Asturienne des Mines, the second largest Belgian zinc producer and active promoter of the cartel, predicts further prolongation of the existence of the Zinc Cartel, for, as the president

says, the stabilization of the industry. But it would appear from hints given in the general meeting of the company that the world price should be pegged between £27 and £28, the Asturienne being in favor of the £28 price. Its electrolytic zinc plant at Eiterheim, Norway, has a capacity of about 35,000 tons, but the ores have to be imported from Spain and elsewhere, because there are no zinc ores of importance in that northern country. The Arnao plant of the Asturienne has been substantially overhauled. The two Norwegian affiliations, Aktieselskabet Thyssefaladene and Det Norske Zinkkompagni, are believed to have a promising future in the zinc industry. It is curious that, at the same time cartel members are pursuing a policy of rigid output restriction, each producer is planning to enlarge and modernize his plants and all are planning to increase quite largely their respective capacities. Even the Vieille Montagne proposes plant enlargements at Port-a-Bouc, France; Menthead, Cumberland, England; Bensberg, Germany; Flone, Belgium; and others. The last word in zinc cartellization, it would thus appear, has not yet been spoken, especially so long as the Americans are hindered by the Sherman Anti-Trust Law.

The price question is constantly being additionally complicated by new technical processes such as selective flotation. One instance out of many is that of the Société d'Exploitations Minières en Tunisie, established in 1926 for the purpose of working the ores of Djebel Touireuf, has subsequently extended the scope of its operations to the region of Sidi-Bou-Krim. The necessity of concentrating these low-grade ores has caused the acquisition of flotation licenses and the Coley metallurgical process. The latter license more recently has been given to the Zinc Manufacturing Company, Ltd., founders of the Zinc Oxide Company, Ltd., also of London. But as the Exploitations Minières holds a large participation in zinc manufacturing, it is not actually disposing of the Coley process. In the application of the flotation process Europe is very active.

Copper Production Costs

IN THE NEXT ISSUE, A. B. Parsons will analyze copper production costs in the light of the data given in the 1928 annual reports. The bare operating costs, in general, vary between five and ten cents a pound, but it is interesting to see what additions are necessary to cover taxes, interest, depreciation, depletion, and other expenses, and what credits are derived from precious metal by-products and from associated enterprises. The operating costs given by Mr. Parsons are particularly illuminating as supplementing the data given in the accompanying table.

The Copper Situation From an Investor's Standpoint

Present Prices Stable, But Dividends Could Be Maintained with Even Lower Levels at End of Year

By E. H. Robie
Associate Editor

SEVERAL EVENTS in the last week or two have again centered interest on the coppers. The Anaconda group announced a curtailment in production of 10 per cent not many weeks after prominent officials of other companies had stated that stocks of the metal were dangerously low and that output was none too large. On May 20, copper securities were particularly weak, Anaconda dropping over 7 per cent of its value in one day, Kennecott close to 6 per cent, and Nevada over 4 per cent. But on the same day Kennecott increased its dividend again, and the next day Phelps Dodge did likewise.

World copper production figures just released show a daily rate of 6,547 tons in April, the highest in history, compared with an average of 5,236 last year and 4,642 tons the year before. Another step in vertical integration of the industry has just been made in the absorption by Kennecott of Chase Brass. It is no wonder that those interested in copper are somewhat in the air, without any clear idea of what to expect.

Certain it is that the urgent demand that sent copper up to 24c. a pound less than two months ago has evaporated, and orders either here or abroad have not even taxed the custom smelters to supply. The situation seems rapidly to be getting back to that which existed last year, when the buying was almost entirely for early shipment.

Consumers evidently feel that plenty of copper will be available with the great increase in production, in spite of the recent curtailment, so that neither they nor the ultimate buyer of manufactured copper products is in any hurry to place forward orders, especially as copper has already dropped 6c. from its high level and seems to them more likely to go down than up.

Decline in Prices Balked

But at 18c. the decline has certainly been arrested since the middle of April, with all the large producers keeping out of the market and letting the more urgent sellers—the custom smelters—take all the business. They feel that if hand-to-mouth buying is again to be in order stocks of refined copper must not be 50,000 tons, as they have been recently, but perhaps twice that. Therefore, the probable increase in refined stocks will not worry them. This increase may amount to 20,000 tons in May.

But they also feel that actual consumption of copper during the remainder of the year may not be so great as was indicated by the buying of the winter months, and that unless they are willing to see a further and perhaps drastic decline in copper prices, at least a temporary cut in the greatly expanded production is advisable.

Utah has already officially reported a drop from its peak production rate amounting to about 6 per cent; Anaconda, Chile and Andes have announced a 10 per cent cut, and some other companies have quietly made similar curtailments. A real effort is therefore being made to have production in accord with consumption and to support the market at the 18c. level, at least through the next buying movement.

And yet, when one realizes the im-

Courtesy of the New York *Evening Post*, by which this article, substantially in its present form, was published on May 25, though given a misleading title.

Production, Earnings, and Dividends of Prominent American Copper Mining Companies

Company	Tons of Copper Produced in 1928	Earnings per Share, 1928	Annual Dividend Rate a Year Ago	Current Annual Dividend Rate	Current Yield on Market Price, Per Cent
Kennecott (new)	260,049	$5.01	$2.50	$5.00	6.2
Anaconda (old)	195,000	6.63	3.00	7.00	7.0
Utah	136,912	15.31	6.00	12.00	3.7
Nevada Con.	134,231	3.13	1.50	3.00	7.0
Chile	132,932	4.51	2.50	3.50	3.7
Phelps Dodge (new)	103,975	1.82	2.50	3.00	4.6
Calumet & Hecla	60,602	1.55	2.00	4.00	10.1
Andes	52,028	1.10	....	3.00	6.2
Cerro de Pasco	48,850	5.12	4.00	6.00	6.4
Inspiration	44,061	2.92	1.00	4.00	10.0
New Cornelia	38,997	2.78	2.00	....	....
Calumet & Ariz. (old)	26,184	8.11	6.00	10.00	7.7
Calumet & Ariz. (new)	65,181	9.22	....	10.00	7.7
Granby	30,505	2.09	4.00	7.00	9.9
Miami	24,129	2.46	1.50	4.00	10.4
United Verde Ext.	22,600	0.97	2.00	4.00	23.0
Howe Sound	21,101	5.24	4.00	4.00	6.6
Magma	18,229	2.43	3.00	5.00	7.4
Greene Cananea	18,210	3.95	....	8.00	5.4
Noranda	16,654	0.63	....	....	....
Copper Range	12,127	0.10	1.00	2.00	9.5
Consolidated Coppermines	10,776	....	....	....	....
Mohawk	10,621	11.20	4.00	6.00	10.5
Mother Lode	8,950	0.41	0.50	0.40	11.0
Old Dominion	8,858	def. 0.24	....	....	....
Mason Valley	8,667	0.50	....	....	....
Tennessee C. & C.	6,793	1.54	0.50	1.00	5.8

mense amount of expansion that is going on in copper-production facilities all over the world, and considers the vast resources of many of the companies, and the low operating costs—running between 5 and 10c. a pound—one cannot help but feel that the price of copper is not unlikely to drop 2 or 3c. from its present level.

A price of 15 or 16c. for copper cannot be considered unsatisfactory, even allowing for the fact that to the bare operating cost, above mentioned, 3 or 4c. should be added to take care of interest, depreciation and depletion.

Although practically every company has increased its dividend greatly over that paid a year ago, some, if not most, could easily maintain their present rates if the price of copper did not drop below 15c. So, although no immediate drop from 18c. seems likely, the end of the year may easily see somewhat lower prices, particularly if some of the signs of a general industrial recession prove prophetic.

The growing concentration of copper production in the hands of the large companies is not generally realized. No important contribution has been made to the supply of copper by scattered small producers even with the price up around 20c. The companies with large mines have it largely within their power to govern production, and therefore prices, but there is sufficient competition to prevent the likelihood of any unjustified price being maintained.

Four Mines Lead in Production

It is of interest to note that four mines are leaders in the production of copper: the Chuquicamata deposit of Chile Copper, with a probable present curtailed production of about 15,000 tons a month; Utah Copper's great Bingham mine, now turning out about 13,500 tons a month; the Butte mines, which, until recently, contributed about a million pounds of copper a day to the Anaconda smelter and which will now have a curtailed production of around 13,500 tons a month, and the Union Minière, which is producing about 13,000 tons a month from its Katanga deposits in Africa.

Some of the leading copper companies of interest to investors are shown in the accompanying table, but several words of explanation are necessary. They are arranged in the order of their production in 1928, which is given in the second column. The earnings per share are taken from published reports and are not in all instances based on the same method of accounting, especially as regards depletion.

The dividend rates given in the fourth and fifth columns are indicative of the increase that has been made in the last year, and are recalculated, in some instances, to the new share basis where split-ups of stocks have occurred. The last column gives the yield, at dividend rates and prices on May 22.

Properties Owned by Kennecott

In addition to its own Alaskan properties, Kennecott owns Braden, in Chile; practically all of Utah Copper, and about half of Mother Lode and Nevada Consolidated; the production data given are exclusive of Mother Lode and Nevada. A two-for-one stock split-up and an increase in dividend have recently occurred.

Nothing very definite can be stated about Anaconda until the merger with Chile and the bond conversions are cleared up and the new dividend rate is definitely announced. Anaconda's combination with Chile will make this the dominant group, so far as production goes, well above Kennecott.

Utah is of no interest to the investor, as little stock is available. It is the country's lowest-cost copper producer, but Chile is even below it. However, Chile has a large bond interest to take care of, and with taxes and depreciation, its real cost rises to 8¼c., even excluding depletion, which is of little moment to this company, holding the world's largest known deposit of copper ore.

Phelps Dodge is a new-comer to the big exchange. It is, however, one of the country's best-known copper companies. Its yield has been low for some years. A four-for-one stock split-up, with a slight increase in the dividend, has recently taken place.

Calumet & Arizona has recently absorbed its subsidiary, New Cornelia, and expansion plans are on foot. Another Arizona producer, Miami, has about the highest cost of the group; its dividend yield is correspondingly high, for its earnings would be more likely to be affected should prices drop. Noranda and Andes each should increase production greatly this year. Consolidated Coppermines is perhaps the least known of any of the companies mentioned. Its property adjoins that of Nevada Consolidated, and is developing into a substantial producer. United Verde Extension has about three more years' supply of ore left, and Mason Valley is about at the end of its rope, with its smelter already closed down. Mother Lode, the only company whose dividend has decreased, had to cut production owing to reported exhaustion of its ore reserves.

Pacific Copper to Be Liquidated

LEGAL procedure to wind up the affairs of the Pacific Copper Company, upon petition of the St. Mary's Mineral Land Company, has entered the final stages. The action has not been contested, and the next step will be the appointment of a receiver preparatory to the sale of the property. St. Mary's controls Pacific through ownership of 20,000 shares, $10 paid, and it plans to take over the entire property.

The land holdings consist of 820 acres, the tract lying just northwest of the old Atlantic. It carries the northerly extension of the Ashbed lode series and it is believed it will become part of a merger with Atlantic lands owned by Copper Range. In event of a reopening of Atlantic, the Pacific property will be needed for extensive opening of the Ashbed.

Metal and Mining Shares Listed on New York Curb

METAL & Mining Shares, Inc., one of several new companies organized during the last year to specialize in securities of mining, smelting and metal companies, was admitted to trading on the New York Curb Market on May 28. Public offering of the shares of the corporation was first made last year, when units consisting of one share of preferred stock and one share of common stock were offered on an over-the-counter basis by P. H. Whiting & Company. Recently the units were divided and the holders of the preferred shares were permitted to exchange them on the basis of one share of preferred for two and a half shares of common. Only the common stock was listed on the Curb. The paid-up capital as of April 30, 1929, was $5,448,639.

The directorate of Metal & Mining Shares, and Mineral Research Corporation, a technical advisory board to Metal & Mining Shares, has been enlarged, and now includes:

Carl O. Lindberg, consulting engineer; Richard M. Atwater, consulting engineer for Ladenburg, Thalmann & Company; John G. Baragwanath, formerly with American Smelting & Refining; John M. Callow, president of General Engineering; William C. Browning, formerly general manager for Magma Copper; Thomas F. Cole, director of Calumet & Arizona; George A. Easley, owner and operator of tin and tungsten mines in Bolivia; John Wellington Finch, consulting engineer; M. D. Huston, vice-president in charge of operations of Tonopah Mining; Samuel H. Dolbear, consulting engineer for Dillon, Read & Company and other interests; and A. B. Parsons, formerly associate editor of *Engineering and Mining Journal.*

Chile Copper Earned $19,943,864 in 1928

Chile Copper Company reports an increase in its net income to $19,943,864 in 1928 from $11,085,537 in 1927. Production increased from 219,600,465 to 265,863,517 lb. of copper.

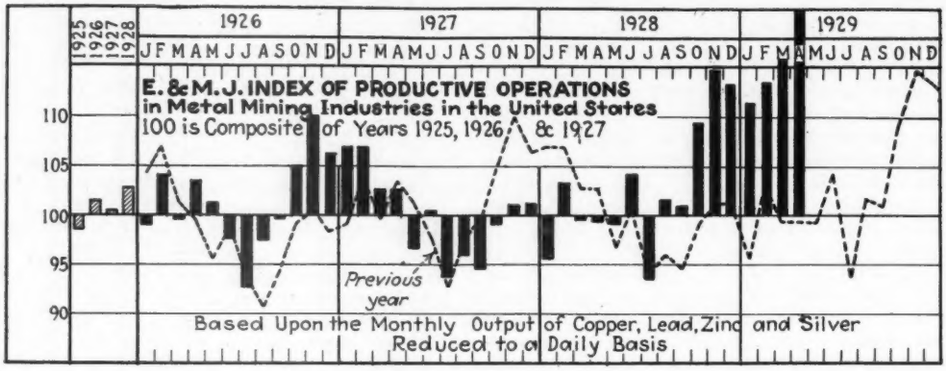
Consolidated Income Account for 1928

Operating revenue:		
Copper sold — 282,998,571 lb. at 15.034c. per pound		$42,544,972
Production cost		14,385,941
Operating profit		$28,159,030
Other income		928,820
		$29,087,850
Charges against income		
Taxes and miscellaneous charges	$4,054,920	
Interest and discount on bonds	2,168,496	
For depreciation and obsolescence of plant and equipment	2,920,569	9,143,986
Net income, carried to balance sheet		$19,943,864

Note—In order to comply with the government income tax requirements for the purpose of computing depletion, an additional valuation of the mining property as of March 1, 1913, has been recorded upon the books of the company; but, being made for tax purposes only, the result of those entries has been omitted from the current statements.

Indicators of Industrial Activity

of Significance to Mining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E. & M. J. INDEX OF PRODUCTIVE OPERATIONS
in Metal Mining Industries in the United States
100 is Composite of Years 1925, 1926 & 1927
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105
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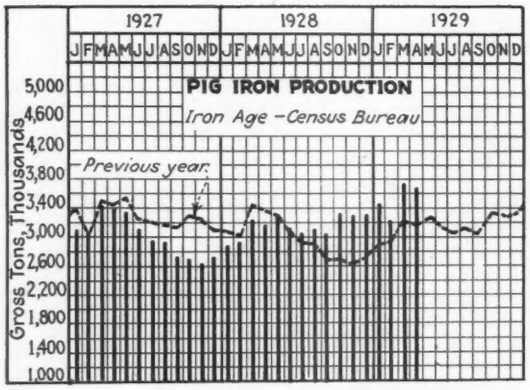
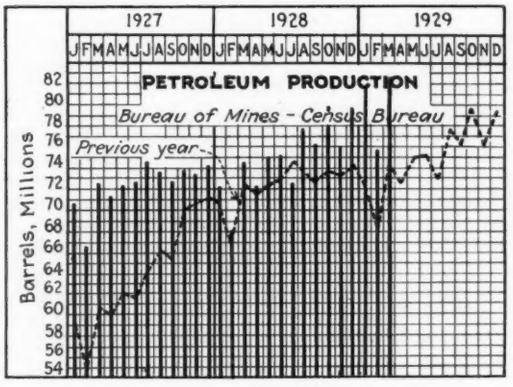
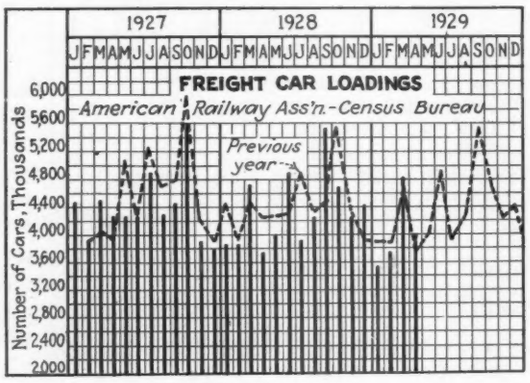
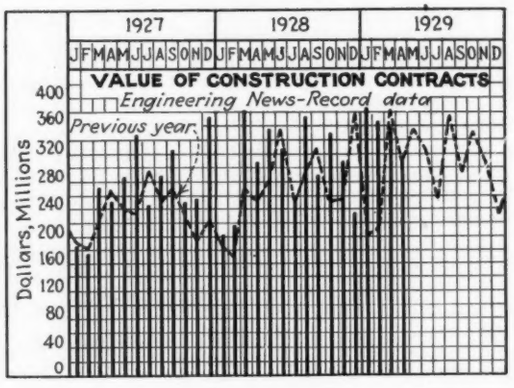
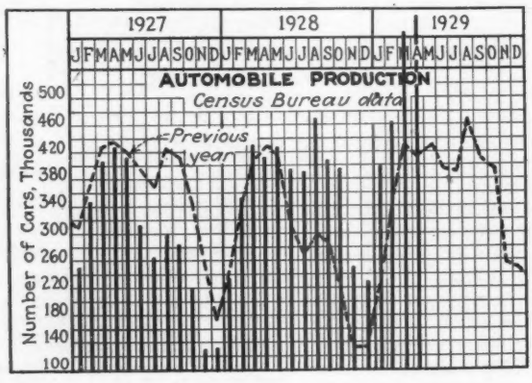
95
90
Previous year
Based Upon the Monthly Output of Copper, Lead, Zinc and Silver
Reduced to a Daily Basis

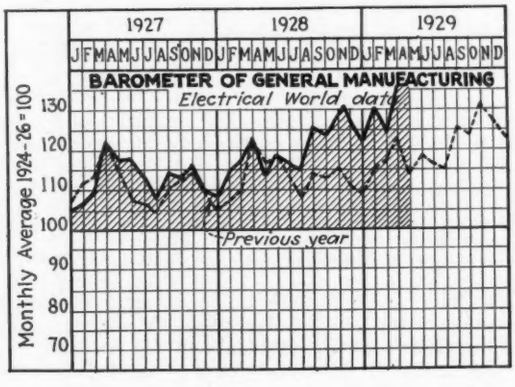












Desloge Considers Selling Out to St. Joe Lead

SALE of the physical property of the Desloge Consolidated Lead Company to the St. Joseph Lead Company for $10,700,000 cash will be passed on by the stockholders of the former company at a meeting to be held on June 1. In addition, if the deal is ratified and the Desloge company is liquidated, bonds and other securities held by the company totaling more than $7,000,000 will be distributed proportionately among the stockholders.

The Desloge Consolidated Lead Company is capitalized for $1,000,000, its stock having a par value of $10 a share. For many years the company has been paying dividends of 8 per cent. Approximately 90 per cent of the stock is held by the families of Firmin Desloge, Louis Fusz, and George H. Backer, who formed the Desloge Consolidated Lead Company. Firmin Desloge, president of the company, is also a very large stockholder in the St. Joseph Lead Company and a director of that company.

Two Developing Properties in Tintic District Are Merged

HOLDINGS of Tintic Empire Mining in the East Tintic district and Lehi Tintic Mining have been taken over by the latter corporation and will be worked under the same management. Guy W. Crane will act as consulting engineer, Charles Zabriskie as superintendent, and R. M. Crocker as mining engineer.

Capitalization of the Lehi Tintic company has been increased from 2,000,000 to 3,000,000 shares, 1,000,000 of which will remain in the treasury. Stock of the Tintic Empire will be exchanged on the basis of eight shares of Tintic Empire for ten of Lehi Tintic.

Retimbering of the Lehi Tintic shaft has been completed to the 750 level and cutting of a station started. Sinking to the 1,100 level will begin at once.

Canadian Bullion to U. S. Mints

Shipments of Ontario crude bullion to branches of the United States mint have been profitable recently owing to Canadian exchange being at a discount greater than 5-32 of 1 per cent, which represents the difference in refining and express charges as between the Canadian and United States mints.

Kirkland Lake Gold Production Increasing

The Ontario Department of Mines statement on gold production for April shows that the Kirkland Lake camp is rapidly overhauling Porcupine. During the month the gold mines of the province treated 333,210 tons and recovered bullion valued at $2,698,837, an average of $8.10 per ton. Kirkland Lake mines treated 91,554 tons and recovered $1,200,168, an average of $13.10. Porcupine mines treated 241,656 tons and recovered $1,498,671, an average of $6.23 per ton. Total production for the month was $86,000 less than in March, but was higher than in January or February.

Valuation of Michigan Copper Mines Increased Slightly in 1929

THE assessed valuations of Michigan copper companies for 1929 compared with those for 1928 are as follows:

	1928	1929
Keweenaw County		
Calumet & Hecla Con. Cliff and Phoenix	$30,000	$60,000
Ahmeek and Allouez	6,000,000	6,000,000
Mohawk	2,030,000	2,000,000
Seneca	875,000	775,000
Douglass Copper Company	.....	40,000
Total Keweenaw County	$8,935,000	$8,875,000
Houghton County		
Calumet & Hecla Con. Ahmeek Mill and R.R.	$800,000	$800,000
Centennial	40,000	90,000
C. & H. Conglom	1,700,000	2,500,000
Osceola	765,000	900,000
North Kearsarge	300,000	200,000
Reclamation	9,550,000	8,600,000
Total C. & H.	$13,155,000	$13,090,000
Copper Range Company Champion Mine	$2,550,000	$2,750,000
Baltic Mine	175,000	175,000
Trimountain	225,000	225,000
Total Copper Range	$2,950,000	$3,150,000
Isle Royale	$1,250,000	$1,250,000
Quincy	800,000	1,000,000
Arcadian	110,000	90,000
Franklin	100,000	100,000
Mayflower-Old Col	80,000	50,000
Hancock Con	49,000	49,000
LaSalle	80,000	80,000
Superior	20,000	20,000
Winona	65,000	65,000
Total Houghton County	$18,659,000	$18,944,000
Value of refined copper on hand	887,200	962,706
Grand total two counties	27,594,000	27,819,000
Total	$28,481,200	$28,781,706

SOUTHWESTERN MIAMI DEVELOPMENT COMPANY recently approved the proposal to sell its properties in the Globe-Miami district to the Inspiration Consolidated Copper Company of Miami. No announcement was made as to the consideration involved in the transfer, but it is reported unofficially that the transaction involves approximately $500,000. The Southwestern Miami Development Company owns approximately twelve mines and various mining claims in Gila County.

INTERNATIONAL NICKEL COMPANY OF CANADA, Ltd., reports net profit of $5,590,191 for the quarter ended March 31, 1929, after depreciation, depletion, interest, and federal taxes, equivalent, after 7 per cent preferred dividend requirements, to 36c. a share earned on 13,758,208 no-par shares of common stock.

LAKE SUPERIOR IRON ORE ASSOCIATION reports shipment of 2,516,241 long tons of iron ore from Upper Lake ports during April, 1929, compared with 5,946 long tons in April, 1928.

London Financial News

By W. A. DOMAN
Special London Correspondent

LONDON, May 14, 1929.—The position of tin was exhaustively dealt with at the meeting of the Anglo-Oriental Mining Corporation by John Howeson, the chairman. He has realized the seriousness of conditions and has endeavored for months to ameliorate them. In his long discourse he uttered a grave warning note. Producers, he asserts, have increased output without regard to price and have ignored the economic aspect of the case. His view is that within measurable period, if no further discoveries of the metal are made, deposits at present being worked will be exhausted. Reading "between the lines," he appears to have two grounds for fear: one, that producers will not realize the position until too late, and the other that market supplies will get out of control. He suggests co-operation. The efforts of one group of companies alone—and the Anglo-Oriental group is probably the strongest—will be futile, for others take advantage of the policy pursued. The present price, he contends, is not a remunerative one. It was never imagined that tin would fall below the £200 mark again, but it has dropped to a level of approximately £197. His mention of market supplies rather supports the belief that large tonnages are being held for higher prices, and as the metal is very expensive to carry, any substantial increase in production over consumption may cause a break. It is even suggested in some quarters that the people whose money is locked up in stocks are already beginning to suffer from cold feet. With such a belief prevalent, buyers are not keen on purchasing more than is necessary for their immediate requirements. If there were a possibility of the price advancing, they would stock themselves at the present level. It is the fact that they are not doing so that causes the apprehension. Every credit is given to Mr. Howeson for his plucky efforts to stabilize the industry, but with so many producers standing out, his task is extremely difficult.

From Paris come reports that the Guggenheims have made the highest bid for the Nebraska nitrate area in Chile. The Chilean government has estimated the content at 80,000,000 quintals, and this quantity is to be extracted within twenty years. Guggenheims guarantee an extraction of between 100,000,000 and 120,000,000 quintals, and are reported to have made a bid of £2,500,000. Other groups were unable to guarantee an extraction of even 80,000,000 quintals.

Recent reports from Stockholm are to the effect that a vein 900 metres long and 350 metres wide, containing copper ore, has been discovered in Gaesstrickland, Sweden, by a man using a dowsing rod. Experts here doubt the width of the vein, though why they should confine their skepticism to this detail is not apparent.

The Market Report

Metal Prices Hold Firm in Continued Quiet Market

New York, May 29, 1929—The ninth week of inactivity in the metal markets closes with prices no lower than they were over a month ago, in spite of violent declines in some other commodity prices, such as wheat, and a major break in the stock market. The metal producers as a group feel that the lack of demand that has existed recently merely marks a change in buying practice from far-forward commitments to buying for prompt shipment, and that they must accept this view of the situation and maintain stable prices until buying again begins. Evidence accumulates that June will witness a relatively heavy demand for all of the major metals, though principally for early delivery. Confidence is expressed in the settlement of the reparations problem within a few days, which is expected greatly to stimulate European demand for metals, with a resultant improvement in the domestic situation.

Daily Prices of Metals

May	Electrolytic Copper	Straits Tin	Lead		Zinc
	Refinery	New York	New York	St. Louis	St. Louis
23	17.775	43 625	7.00	6.75@6.80	6.625
24	17.775	43 625	7.00	6.75@6.80	6.625
25	17.775	43 625	7.00	6.70@6.80	6.625
27	17.775	43 50	7.00	6.80	6.625
28	17.775	43.375	7.00	6.80	6.625
29	17 775	43.50	7.00	6.80	6.625
	17 775	43.542	7.000	6.783	6.625

Average prices for calendar week ending May 25, 1929, are: Copper, 17.775; Straits tin, 43.729; N. Y. lead, 7.000; St. Louis lead, 6.754; zinc, 6.617; and silver, 53.708.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; that is delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted.

Quotations for copper are for the ordinary form of wire bars and ingot bars. For ingots an extra 0.05c. per pound is charged; for slabs, 0.075c.; and for cakes, 0.125c. up, depending on weight. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

May	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
23	72	71 1/2	83 1/2	196	198 7/8	23 5/8	23 3/8	26 3/4	26 1/2
24	72 5/8	72 1/4	83 1/2	196 3/4	199	23 5/8	23 3/8	26 3/4	26 1/2
27	72 1/2	72	84	196 1/2	199	23 11/16	23 7/16	26 7/8	26 1/2
28	72	71 3/4	84	195 3/4	198 1/2	23 11/16	23 3/8	26 7/8	26 7/16
29	72 3/8	71 7/8	84	196 1/4	199 1/8	23 5/8	23 7/16	26 7/8	26 3/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

May	Sterling Exchange "Checks"	Silver		Gold London	May	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
23	4.84 3/8	53 3/8	24 13/16	84s11 1/4d	27	4.84 1/2	53 3/8	24 7/8	84s11 1/4d
24	4.84 7/16	53 5/8	24 13/16	84s11 1/2d	28	4.84 1/2	53 1/2	24 5/8	84s11d
25	4.84 1/2	53 3/4	25	.....	29	4.84 7/16	53 1/4	24 5/8	84s11 1/2d

Average: Silver, 53.458c.; Sterling Exchange, 484.458c.

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of silver, 999 fine. London silver quotations are in pence per troy ounce of bar silver, basis 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Copper Buying Somewhat Better

The copper situation is unchanged except that total sales for the week ending today have been better than they have been for the last six weeks, and that the unfilled orders of the large producers are continuing to accumulate. Three sellers continue to monopolize the business for electrolytic, all of their business being booked on the basis of 18c., delivered Connecticut. The June requirements of consumers are not entirely provided for, and scarcely any copper has been booked for later deliveries, so that the expectation is that buying will begin soon. However, the first signs of an improvement in demand are expected to come from abroad, where manufacturers are almost certainly practically out of copper. Some domestic consumers have requested anticipation of shipment, indicating that they are postponing any further buying, even for prompt shipment, until the last minute. Manufacturers report that their orders from ultimate consumers are very disappointing, but it is thought that the situation here is much the same as it is among the sellers of metals, and that no important decline in the consumption of metal goods is likely to be observed.

The Copper Exporters' price continues at 18.30c., c.i.f. usual European ports. Business this month has been but little better than it was in April, but shipments have compared very well with earlier months in the year, so that little or no unsold copper intended for foreign consumption has been accumulating at the refineries.

Lead Market Steady

Though volume of sales in the last week has not been large, the lead market appears quite steady, and, barring any further substantial decline in London quotations, the present price level seems likely to be maintained. A feature of the week's business has been the preponderance of carload lots sold for prompt delivery. In several directions this condition is taken to indicate that consumers are piecing out immediate requirements with these small commitments and postponing large-scale buying as long as possible in order to be in position to take advantage of any price weakness that might develop.

The St. Louis market is appreciably stronger. If the contemplated absorption of the Desloge Company by St. Joe becomes effective, this market will lose considerable of its speculative character and price cutting will become less

prevalent during periods of inactive demand. Today the price in this market appears fairly well established at the 6.80c. level, with all sellers but one apparently holding firmly at that price.

No Interest in Zinc

Sales of zinc have been few and far between, the mild activity reported last week having entirely subsided. Nevertheless, many of the producers remain optimistic as regards the prospect of early buying, and expect soon to get their price of 6.80c. An occasional car goes out at that price, but most of the metal sold is at considerably lower levels, 6.55c. being the minimum reported this week by one seller. In the last day or two, however, 6.575c. seems to have been the low end of the range. Prompt shipment is all that is wanted.

CORRECTION—The price of forward zinc in London on May 15 was erroneously reported at £26 1s, the correct figure being £26 7s 6d.

Tin Unchanged

Quiet continues to prevail in the tin market. An ample supply of spot tin appears to have become available recently in this country. Considerable propaganda has been coming from London recently concerning the rationalization of the tin industry. However, as long as producers continue to operate profitably at present price levels there appears to be little likelihood of any curtailment in output, and that, after all, in large part is the best solution for the present situation.

Silver Continues Decline

Continued weakness in China exchanges, with lack of support from either China or India, has had a further depressing effect on silver. The rates on May 28, of 24 5/8d. in London and 53 1/8c. in New York, were the lowest prices quoted since December, 1926. The market is quiet, with an uncertain tendency.

Mexican Dollars (old Mexican pesos): May 23d, 40 1/4c.; 24th, 40 1/4c.; 25th, 40 3/8c.; 27th, 40 1/2c.; 28th, 40 1/4c.; 29th, 40 3/8c.

Foreign Exchange

Closing cable quotations on the principal foreign exchanges on Tuesday, May 28, were as follows: Francs, 3.91 1/32c.; lire, 5.23 7/8c.; and marks, 23.85c. Canadian dollars, 3/32 of 1 per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

ALUMINUM—Per lb., 99 per cent plus grades, price of leading interest, 24.30c. Outside market, 99 per cent plus, 24.30c.; 98-99 per cent, 23.90c.

ANTIMONY—Per lb., duty paid, New York: Chinese brands, 8 7/8@9c. per lb. for all positions. Cookson's "C" grade, spot, 14c.

BISMUTH—Per lb., New York, in ton lots. $1.70. Smaller lots, $1.85 and up.

CADMIUM — Per lb., New York: 80@95c. Active demand.

IRIDIUM — Per oz., $230@$240 for 98@99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 35c. (99.9 per cent grade) for single lots of spot metal.

PALLADIUM — Per oz., $38@$40. Small lots bring up to $50. Nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, $68 per oz. Transactions between dealers and refiners in the outside market are commonly reported at several dollars less.

QUICKSILVER — Per 76-lb. flask, $121. Small lots command the usual premiums.

Prices of Chromium, Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Titanium, Tungsten, Vanadium, and Zirconium are unchanged from the issue of May 4.

Metallic Ores

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $16.50@$17; Western scheelite, $16.50. Nominal.

Antimony, Chrome, Iron, Manganese, Tantalum, Titanium, Vanadium, and Zircon ores are unchanged from quotations in the May 4 issue.

Labor Shortage Lowers Tri-State Production

Joplin, Mo., May 25, 1929

Blende	Per Ton
High	$45.75
Premium blende, basis 60 per cent zinc	$44.00@ 45.00
Prime Western, basis 6 per cent zinc	43.00@ 44.00
Table concentrates, 60 per cent zinc	41.00@ 43.00
Flotation slimes, 60 per cent zinc	39.00@ 41.00
Average settling price, all zinc	43.89
Galena	
High	92.80
Basis 80 per cent lead	90.00
Average settling price, all lead	90.97

Shipments for the week: Blende, 9,338; lead, 2,310 tons. Value all concentrates the week, $619,980.

Shipments five months: Blende, 264,018; lead, 47,620 tons. Value all concentrates five months, $15,464,310.

The exodus of miners to western camps, to the strawberry fields, and on spring camping and outing expeditions has assumed proportions larger than at first belived probable, and is causing a needed restriction of output to the level of prevailing demand. Although the number of mills in operation has not materially lessened, the labor shortage has necessitated their operation on part time.

Buyers have bought sparingly during the last two months. They have cleaned up all forward purchases and are now shipping each week the current tonnage purchased. A returning wave of heavier buying is anticipated for June—strong enough to remove the increment to stocks accumulated during the period of light buying. The increased stock of zinc concentrates in the bins has proved no menace to a steady market, as the ore is held by companies financially able to carry it until it is needed.

Platteville, Wis., May 25, 1929

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$46.75
Lead Ore	
Lead, basis 80 per cent	$90.00

Shipments for the week: Blende 664 tons; lead, none. Shipments for the year: Blende, 1,411; lead, 760 tons. Shipments for the week to separating plants, 1,237 tons blende.

The price of blende was erroneously quoted as $42.75 for the 60 per cent zinc basis during the week of April 27 in our May 11 issue. It should have been $46.75 for the 60 per cent basis.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, and Tripoli are unchanged from prices in the May 4 issue.

Metallic Compounds

ARSENIOUS OXIDE (White Arsenic) Per lb., 4c. Market firm.

Antimony Oxide, Calcium Molybdate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the May 4 issue.

Alloys

FERROMANGANESE—Per long ton, domestic and foreign, f.o.b. furnace or duty paid, port of entry, $105. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent W, $1.35@$1.50 f.o.b. works. Market strong.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferrovanadium, Nickel Silver, and Yellow (Muntz) Metal are unchanged from prices in the May 4 issue.

Rolled Metals

Copper, Lead, Zinc, Monel Metal, and Nickel Sheets are unchanged from prices in the May 4 issue.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the issue of May 4.

Iron, Steel and Coke

IRON—Per gross ton, Valley furnaces, Bessemer, $19; basic, $18.50; No. 2 foundry, $18.50.

STEEL—Base prices per gross ton Pittsburgh, billets and slabs, $35@$36; plates, structural shapes, and soft steel bars, per 100 lb., $1.95.

COKE—Per gross ton, Connellsville furnace, $2.75@$2.85. Connellsville foundry, $3.75@$4.85. Byproduct coke, Ohio and Kentucky (Connellsville basis) $6.50: Buffalo and Detroit, $8.50@$9.

Mining Stocks—Week Ended May 25, 1929

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	125½	100	102⅛	Mr.29,My.20 Q	1.75
Anaconda Cop., new	New York	107⅛	99	104		
Andes Copper	New York	52	47½	47⅛	Mr.29, My.6 Q	0.75
Arizona Com	Boston	3⅛	3⅛	3⅛	Ja. 16, Ja. 31 SA	0.25
Calumet & Ariz	New York	131¼	127	128⅛	My.31, Je.17 Q	2.50
Calumet & Hecla	Boston	42	39⅛	40⅛	My.31, Je.29 Q	1.00
Cerro de Pasco	New York	97⅛	92⅛	92⅛	Ap.11, My. 1 Q	1.50
Chile Copper	New York	95	95	95	Je. 1, Je.28 Q	0.87½
Con. Coppermines	N. Y. Curb	11⅛	10	10½		
Copper Range	Boston	22⅛	20⅛	21⅛	Mr.15, Ap.15 Q	0.50
East Butte	Boston	3⅛	3	3	Dec., 1919	0.50
Granby Con	New York	74	69⅛	69⅛	Ap.12, My.1 Q	1.75
Greene Cananea	New York	151⅛	142	142	Je. 6, Jl. 1 Q	2.00
Howe Sound	New York	64	59⅛	61	Mr. 30, Ap. 15 Q	1.00
Hudson Bay	N. Y. Curb	17⅛	17	17⅛		
Inspiration	New York	44⅛	40	41½	Je.13, Jl. 1 Q	1.00
Isle Royale	Boston	22	20½	21	My. 31, Je.29	0.50
Kennecott	New York	88½	81	82½	My. 31, Jl. 1 Q	1.25
Magma Copper	New York	69⅛	66	66⅛	Mr.30, Ap.16 Q	1.25
Mason Valley	N. Y. Curb	1⅛	1⅛	1⅛		
Miami Copper	New York	40	37	38	My1, My15 Q	1.00
Mohawk	Boston	57	55	55⅛	Ap. 30, Je. 1 Q	1.50
Mother Lode	New York	3⅛	3⅛	3⅛	De.14, De.31 SA	0.20
Nevada Con	New York	46⅛	42⅛	43⅛	Mr.15, Mr.30 Q	0.75
New Cornelia	N. Y. Curb			47⅛	Fe. 1, Fe. 18 Q	0.50
Noranda	N. Y. Curb	56⅛	50⅛	51⅛		
Ohio Copper	N. Y. Curb	2	1⅛	2	Sept., 1926	0.03
Old Dominion	Boston	11⅛	9⅛	10⅛	Dec., 1918	1.00
Phelps Dodge, new	N. Y. Curb			79⅛	Je. 4, Jl. 1 Q	0.75
Quincy	Boston	35	32	35	March, 1920	1.00
Roan Antelope	N. Y. Curb	43⅛	41	42⅛		
St. Mary's M. L.	Boston	34	32⅛	33	Fe.25, Mr.12	2.00
Seneca Copper	New York	5⅛	4⅛	4⅛		
Shattuck Denn	N. Y. Curb	18	15⅛	17⅛		
Sherritt-Gordon	Toronto	7.90	7.10	7.50		
Tenn. C. & C.	New York	18⅛	17⅛	17⅛	My.31, Je.15 Q	0.25
United Verde Ex	N. Y. Curb	17⅛	17⅛	17⅛	Ap. 4, My. 1 Q	1.00
Utah Copper	New York	300	300	300	Mr. 15, Mr. 30 Q	3.00
Waite-Ack.-Mont	Toronto	4.00	3.75	4.00		
Walker Mining	Salt Lake	3.90	3.80	3.80		
Wenden Copper	N. Y. Curb	1⅛	1⅛	1⅛		
LEAD, ZINC, SILVER						
Ahumada Lead	New York	2⅛	2	2⅛		
Amer. Z. L. & S.	New York	34	29	30	May, 1917	1.00
A. Z. L. & S., pfd.	New York	100	100	100	Je.14, Jl. 1	1.50
Bingham Mines	Boston	56	55⅛	55⅛	Mr.15, Ap.5	0.50
Bunker Hill & S.	N. Y. Curb	149⅛	149⅛	149⅛	Ap.25, My.6 X	0.75
Butte Cop. & Zn	New York	5⅛	5	5⅛		
Butte Cop. Con.	Boston Curb	*52	*50	*51		
Butte & Sup.	New York	7⅛	7	7	Mr. 15, Mr. 30 Q	0.50
Callahan Zn-Ld.	New York	2⅛	2	2	Dec., 1920	0.50
Chief Consol.	Salt Lake	3.30	3.10	3.10	Fe. 1, 1928 K	0.10
Consol. Ld. & Zn. "A"	St. Louis	15⅛	14⅛	14⅛	Ap.5, Ap.10	0.25
Constitution	Spokane	*36	*33	*36		
Dayrock	Spokane	2.57	2.50	2.55	Je.20, Je.30	0.03
Dickens Consol	Spokane	*6⅛	*4⅛	*3⅛		
Eagle-Picher	Cincinnati	17⅛	17	17	Mr.31, Ap.15 Q	0.20
Eagle-Pich., pfd.	Cincinnati			102	Jan. 15 Q	1.50
Erupcion	Boston Curb	*13	*13	*13	Ja. 1, 1928 Q	0.07½
Eureka Bullion	Salt Lake	102⅛	*97	*97		
Eureka Lilly	Salt Lake			1.42½		
Eureka Standard	Salt Lake	3.37½	3.32½	3.32½		
Evans-Wallower	N. Y. Curb	19⅛	17	17⅛		
Evans-Wal., pfd.	N. Y. Curb			84⅛	Mr.20, Ap.1 Q	1.75
Federal M. & S.	New York	220	215	217	Je., 1927	10.00
Fed. M. & S., pfd.	New York	99	99	99	My.24, Je.15 Q	1.75
Gladstone	Spokane	*12	*11	*11		
Golconda	Spokane	1.59	1.35	1.40	Je.15, Jl.1	0.02
Grandview	Spokane	*41½	*35½	*38		
Hecla Mining	N. Y. Curb	18	17⅞	17⅞	My.15, Je.15 Q	0.25
Highland-Surprise	Spokane	*15½	*14	*14⅛		
Jack Waite	Spokane	*11	*10½	*10⅞		
Kootenay Florence	Spokane	*13½	*12⅛	*12⅛		
Lucky Jim	Spokane	*12⅛	*12½	*12⅛		
Lucky Tiger-C.	Kansas City	†5.00	†4.75	....	De.4, De.20 MX	0.12
Mexican Premier	Spokane	2.00	1.79	2.00		
National Lead	New York	145	142	145	Je. 14, Je. 29 Q	1.25
Natl. Lead, pfd. A	New York	140½	140	140	Mr. 1, Mr. 15 Q	1.75
Natl. Lead, pfd. B	New York	118	118	118	Jy. 19, Au 1 Q	1.50
N. J. Zinc, new	N. Y. Curb	80	79	80		
New Quincy	Salt Lake			2.40	My.15, My.27 Q	0.10
Noble Five	Spokane	*67	*52	*69		
North Lily	Salt Lake	8.25	8.25	8.25	Jan. 20 Q	0.25
Park Bingham	Salt Lake	7.50	6.75	6.75		
Park Utah	New York	9	7⅛	8⅛	Mr. 19, Ap. 10 Q	0.20
Pend Oreille	Spokane	5.50	4.50	5.25		
Rico Argentine	Salt Lake	*35	*31	*31	No. 30, De. 15 Q	0.03
Ruth-Hope	Spokane	*34	*25	*25		
St. Joseph Lead	New York			71⅛	Ju. 8, Ju.20 QX	0.75
Sherman Lead	Spokane	*36	*35	*36		
Silver King Coa	Salt Lake	13⅛	13⅛	13⅛	Mr. 20, Ap. 1 Q	0.25
Silversmith	Spokane	*15⅛	*14	*14	Oct., 1926 Q	0.02
Sunshine Mining	Spokane	2.28	2.18	2.28	De. 20, BM	0.02
Tamarack-Custer	Spokane	*59	*43	*59	Sept., 1924	0.25
Tintic Standard	Salt Lake	14	13⅛	14	De. 23, Ja. 23 X	0.20
Tonopah Belmont	N. Y. Curb	*62⅛	*62⅛	*62⅛	Oct., 1925	0.05
Treadwell-Yukon	Toronto	12.00	11.50	11.50		
United Zinc Smg	N. Y. Curb			1⅛		
Utah Apex	Boston	4⅛	3⅛	3⅛	May 15, June 1	0.25
Utah Met. & Tun	Boston	1⅛	1	1 1/16	Dec., 1917	0.30
Whitewater	Spokane	*73	*65	*72		
Yellow Pine	Los Angeles			*16	Dec., 1925 QX	0.04
GOLD						
Alaska Juneau	New York	5⅞	5⅛	5⅛		
Barry-Hollinger	Toronto	*30	*28	*29⅛		
Central Manitoba	Toronto	*48	*42	*43		
Coniaurum	Toronto			*45		
Cresson Consol	N. Y. Curb	*75	*68⅛	*68⅛	Mr.30, Ap.10 Q	0.02
Dome Mines	New York	9⅞	9⅛	9⅛	Mr.30, Ap..20 Q	0.25
Golden Cycle	Col. Springs	†1.86	†1.85	....	Fe.15, Mr.1	0.04
Gold Hill	Toronto	*3⅜	*3	*3		
Hollinger	Toronto	6.25	6.00	6.00	My.31, Je.17	0.05
Homestake	New York	76⅞	76⅛	76⅛	My.20, My.25 M	0.50
Kirkland Lake	Toronto	1.02	*88	*88		
Lake Shore	Toronto	25.60	24.50	24.50	Je.1, Je.15 Q	0.20
McIntyre-Porc	New York	17	17	17	My.1, Je.1 Q	0.25
Portland	Colo.Springs	†*12	†*10⅛	....	April, 1927	0.02
Rand Mines	New York	....	....	35⅛	Fe. 21,'28 Am.Sh.	1.52
Siscoe	Toronto	*78	*64	*66⅛		
Sylvanite	Toronto	1.54	1.49	1.49		
Teck-Hughes	Toronto	9.00	8.40	8.75	Ap. 7,My 1, O	0.15
Tom Reed	Los Angeles	*25	*15	*15	Dec., 1926	0.02
Unity Gold	N. Y. Curb	1⅜	1⅛	1⅜		
Vipond Consol	Toronto	1.00	*94	*94	April, 1927	0.03
Wright-Hargreaves	Toronto	1.56	1.50	1.50	Oc. 16, No. 1	0.02½
Yukon-Alaska	N. Y. Curb	....	....	35⅛		
GOLD AND SILVER						
Carnegie Metals	N. Y. Curb	17⅛	16⅛	16⅛		
Castle-Trethewey	Toronto	*33	*32	*33		
Consol. Cortez	N. Y. Curb			*18⅛		
Dolores Esperanza	N. Y. Curb	1⅛	*87⅛	*87⅛	July, 1923	0.05
Keeley	Toronto	*52	*48	*48	Mr.15, 1928	0.04
Mining Corp.	Toronto	4.37	4.00	4.05	My 30, Je.13	0.12½
Montana-Idaho	Spokane	*12⅜	*11	*11		
N. Y. & Hond. Ros	N. Y. Curb	17⅛	17⅛	17⅛	Ap.17,Ap.27 QX	0.05
Nipissing	N. Y. Curb	2⅛	2⅛	2⅛	Mr.30,Ap.20 Q	0.07½
Premier Gold	N. Y. Curb	10	1⅛	1⅛	Mr.14, Ap.4	0.06
Tonopah Exten	N. Y. Curb	....	....	*10	April, 1925	0.05
Tonopah Mining	N. Y. Curb	3⅛	3⅛	3⅛	Ap. 7, Ap. 20	0.07½
United Eastern	N. Y. Curb	*75	*68⅛	*75		
Yukon Gold	N. Y. Curb	*75	*56½	*56½	June, 1918	0.02
IRON AND STEEL						
Bethlehem Steel	New York	106	97⅛	98⅛	Jl.19, Au.15 Q	1.00
Beth. Steel, pfd, 7%	New York	120	118⅛	119	Je.1, Jl.1 Q	1.75
Cleveland-Cliffs	Cleveland	235	200	230	Ap.15, Ap.25 Q	1.00
Colo. Fuel & Iron	New York	65⅞	59⅛	61		
Colo. F. & I., 1st pfd.	New York	....	....	78	My.10,My.25, Q	2.00
Great Northern Iron	New York	28⅛	27	27½	Dec.15, K	2.00
Inland Steel	New York	87⅛	84⅛	87	My.15, Jn. 1, Q	0.87½
Republic I. & S.	New York	94⅛	87⅛	91	My. 11, Je. 1, Q	1.00
Republic I. & S., pfd.	New York	....	....	111	Je .12, Jl. 1, Q	1.75
Sloss-Sheffield S. & I.	New York	102	60½	60½	Mr. 11, Mr.20, Q	1.50
Sloss-Sheff. S. & I., pfd.	New York	106	106	106	Je.20, Jl.1, Q	1.75
U. S. Steel	New York	175⅛	166½	167⅞		
U. S. Steel, pfd.	New York	142⅜	142	142	My. 4,My 29, Q	1.75
U. S. Steel, new	New York	175	165½	168		
Virginia I. C. & C.	New York	....	....	2½	Jan., 1924	1.50
Virginia I.C.& C., pfd.	New York	....	....	47	Jl.16, 1928	SA 2.50
MISCELLANEOUS						
Aluminum Co. of Am.	N. Y. Curb	290⅛	275	275		
Alum.Co.of Amer., pf.	N. Y. Curb	107⅛	107⅛	107⅛	Mr.15, Ap.1, Q	1.50
American Metal	New York	57⅜	51	51⅛	My.9, Je. 1 Q	0.75
Amer. Metal, pfd., 6%	New York	115⅛	113⅛	113⅛	My.21, Je.1, Q	1.50
Amer. Sm. & Ref.	New York	101⅛	97⅛	98⅛	Ap.12, My.14 Q	1.00
Amer. & Sm. Ref., pfd.	New York	135	135	135	My. 3, Ju. 1 Q	1.75
Ang. Ch. Nitrate	N. Y. Curb	42⅛	39½	39½		
Asbestos Corp.	Montreal	13⅛	12	12	Jan. 1926	1.50
Asbestos Corp., pfd.	Montreal	40	40	40	De. 31, Ja. 15 Q	1.75
Consol. M. & S.	Montreal	400⅛	395	395	De.31,Ja.15,SA	6.25
De Beers Consol.	New York	....	....	23	Ja. 19, Ja.26,	0.48
Federated Metals	N. Y. Curb	32	31⅛	31⅛	Mr.27, Ap.5 Q	0.75
Freeport Texas	New York	45	41	41	Ap. 5, My. 1 Q	1.00
Int. Nickel Can.	New York	51⅛	45⅛	47⅛	Je.1, Je.29 Q	0.20
Int. Nickel, pfd.	New York	....	....	121	Ap.2,My.1No.1Q	1.75
Newmont	N. Y. Curb	204	197	197	Mr.30, Ap.15 Q	1.00
Patiño M. & E.	New York	40	36⅛	36⅞	My. 31, Jn. 28	4a
So. America G. & P.	N. Y. Curb	2⅛	2⅛	2⅛		
Texas Gulf Sulphur	New York	77	72⅛	73⅛	Je.1, Je.15 Q	1.00
U. S. Sm. R. & M.	New York	58⅛	53	53	Ap. 4, Ap. 15 Q	0.87½
U. S. Sm. R. & M., pfd.	New York	54⅛	53⅛	53⅛	Ap. 4, Ap. 15 Q	0.87½
Vanadium Corp.	New York	91	83	83⅛	Fe.1, Fe. 15 Q	0.75

Toronto Standard Stock Exchange, Toronto, courtesy Arthur E. Moysey & Co.; Salt Lake Stock Exchange, courtesy J. A. Hogle & Co. and Logan & Bryan, New York; Standard Stock Exchange, Spokane, courtesy Pohlman Investment Company.

*Cents per share. †Bid or asked. Q, Quarterly. A. Annually. SA, Semi-annually. M, Monthly. BM, Bimonthly. FW, Four weeks. K, Irregular. I, Initial. R, Resumption. X, Extra. The first data given is that of the closing of the books; the second that of the payment of the dividend.

LONDON QUOTATIONS—WEEK ENDED MAY 14, 1929

	High	Low	Last	Date	Amount
Alaska Mexican ($5)	20/—	20/—	20/—		
Alaska Treadwell (25)	67/6	66/10½	67/3	Nov., 1926	4 p.c.(d)
Aramayo Mines (25 frs.)	61/3	58/9	60/—	May 1929	5 p.c.(†)
Burma Corp (10 rupees)	17/6	16/7½	17/3	Feb., 1929	7 annas*
Bwana M'Kubwa (5s)	18/3	16/9	17/3		
Camp Bird (2s)	2/6	2/—	2/3	April, 1928	16⅔ p.c.
El Oro (£1)	4/6	4/—	4/6	Nov., 1924	2½ p.c.*
Frontino & Bolivia (£)	8/9	8/—	8/9	Jan., 1929	3½ p.c.
International Nickel of Canada (Quoted in dollars with a fixed rate of $5 to the £1) (no par value)	$55⅛	$50⅜	$51⅛	Mar., 1929	20(c)
Mexican Corpn. (£1)	14/7½	13/7½	14/—		
Mexican Mines of El Oro (£1)	5/—	2/6	4/3	Dec., 1926	3¼ p.c.*
Mount Isa (£)	47/—	46/—	46/10½		
N'Changa Copper Mining. (£1)	72/3	69/4½	70/—		
Oroville Dredging (4s)	2/3	2/3	2/3	Nov., 1928	31½ p.c.
Rhodesian Congo Border (£1)	122/6	113/9	116/3		
St. John del Rey (£1)	19/—	17/6	18/—	Apr., 1929	7½ p.c.
San Francisco Mines (10s)	37/10½	36/—	36/10½	Jan., 1929	25 p.c.
Santa Gertrudis (£1)	12/—	10/6	10/9	Jan, 1929	7½ p.c.
Selukwe (2s. 6d.)	6/—	4/9	5/3	April, 1917	6⅔ p.c.
S. Amer. Copper (2s.)	2/7½	2/3	2/3	Nov. 1917	75 p.c.
Tanganyika (£1)	62/6	59/4½	60/—	July, 1928	5 p.c.
Union Miniere de Haut-Katanga (Brussels)	11,995	11,850	11,885	April, 1929	300.00 fr.

*Free of British income tax. †Swiss francs and plus 15 p. c. bonus. ‡Belgian francs and free of taxation. (d) U. S. Dollars.